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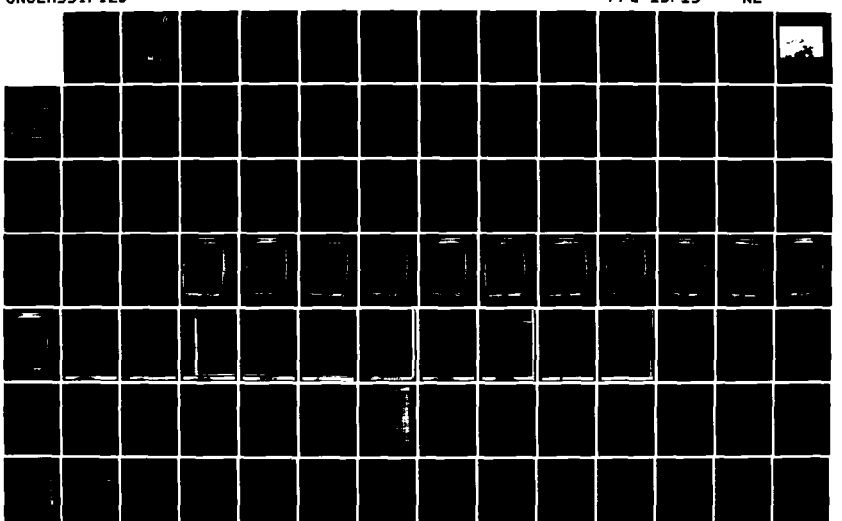

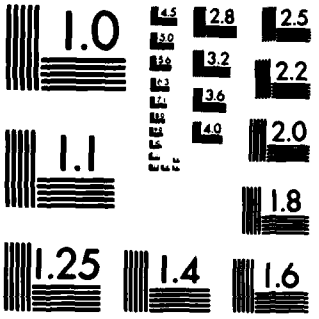

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CONNECTICUT RIVER BASIN
SOUTHWICK, MASSACHUSETTS

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CONGAMOND LAKES
NORTH DIKE
MA 00072

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00072	2. GOVT ACCESSION NO. AD-A145 345	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Congamond Lake North Dike NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE August, 1980 13. NUMBER OF PAGES 95
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Connecticut River Basin
Southwick, Massachusetts

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Congamond Lake North Dike is approximately 80 feet long with a maximum height of 29 feet. The top width of the dike is approximately 60 feet at elevation 234 MSL Because the dike is classified as intermediate size and a high hazard potential, the test flood is the PMF.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

MAR 06 1981

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Congamond Lakes North Dike (MA-00072) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

CONGAMOND LAKES - NORTH DIKE

MA 00072

CONNECTICUT RIVER BASIN
SOUTHWICK, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	MA 00072
Name of Dam:	CONGAMOND LAKES - NORTH DIKE
Town:	SOUTHWICK
County and State:	HAMPDEN, MASSACHUSETTS
Stream:	GREAT BROOK
Date of Inspection:	6 JUNE 1980

BRIEF ASSESSMENT

Congamond Lakes North Dike impounds North Pond which is one of the three ponds which make up the Congamond Lakes. All of the three ponds, North Pond, South Pond and Middle Pond are interconnected by culverts or bridges. Together the three ponds are approximately three miles long and up to one-third mile wide with a total surface area of about 465 acres. The North Dike was constructed to replace an earlier dike (which plugged an old canal) and which failed in 1955.

The North Dike is approximately 80 feet long with a maximum height of 29 feet. An unpaved road passes over the top of the dike in an east/west direction. The top width of the dike is approximately 60 feet at elevation 234 MSL. The upstream face has an average slope of about 9 percent to a height about 7 feet above the normal water level (elevation 225 MSL) at which point the slope flattens to about 3 percent to the top of the dike which is about 8 feet above the normal water level. The downstream face has a slope of 2H:1V and is covered by a trash dump.

There is no spillway nor regulating gates at North Dike. The present outlet for the lakes is at Middle Pond where Berkshire Avenue crosses Great Brook about 2 miles to the south of North Dike. During annual floods, the direction of flow in Great Brook reverses itself and flows back towards Congamond Lakes. The outlet structure at Berkshire Avenue has stoplogs which are inserted to prevent Great Brook from flooding back into the lakes. While the stoplogs are in place, Congamond Lakes has no outlet. After the flood stage of Great Brook recedes, the stoplogs are removed and Congamond Lakes are allowed to drain.

An earlier dike at North Pond failed by overtopping as a result of Hurricane Diane in 1955. Two houses were destroyed; however, both houses had been evacuated and no loss of life resulted. A downstream well field, which serves the Town of West Springfield was damaged. Action taken by town personnel prevented more serious flood damage by blocking the bridge opening between Middle Pond and North Pond (see location map) thus containing the greater part of the stored volume. A new North Dike was constructed by the Commonwealth of Massachusetts Department of Public Works, Division of Waterways in 1956-57 under a flood relief program.

Because the dike is classified as intermediate size and a high hazard potential, the test flood is the Probable Maximum Flood (PMF). The PMF inflow into Congamond Lakes, assuming that the stoplogs are in place at Berkshire Avenue would cause the lake level to rise to approximate elevation 232 MSL which is about 2 feet below the top of the dike.

A major breach of Congamond Lakes North Dike, could result in serious damage or destruction of South Longyard Road and one house approximately 1300 feet downstream of the dike. At Route 57, about 1.7 miles downstream, three structures could be subject to an estimated 3 to 4 feet of flooding.

An additional 6 to 12 homes could be subject to an estimated 1 to 3 feet of flooding in the Shaker Road area which lies in the City of Westfield about 3 miles downstream of North Dike. Loss of more than a few lives would be likely. It should be noted that this part of the downstream area has experienced recent development.

The present condition of the dike is fair.

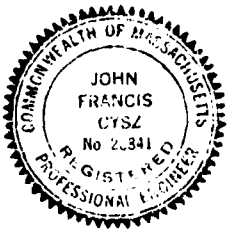
A number of recommendations and remedial measures are given in Sections 7.2 and 7.3 for implementation by the owner. These recommendations should be implemented within 1 year of receipt of the Phase I Inspection Report.

These recommendations, in general, are as follows:

- The ownership of the dike and responsibility for its safety and maintenance should be studied and determined by the Commonwealth of Massachusetts.

- The owner should engage a qualified Registered Professional Engineer to design repairs to the upstream slope including vegetation and displaced riprap. Procedures should be designed and supervised by the engineer to remove the trash dump and trees on the downstream face of the dike and for at least 100 feet beyond the downstream toe. In addition an erosion resistant surface should be designed and constructed on the downstream face after trees and trash have been removed.

The owner should also implement the recommended remedial program including filling of erosion gullies on upstream slope, the establishment of a formal maintenance program, and a formal surveillance and downstream warning (emergency preparedness) program. A qualified Registered Professional Engineer should also be engaged to make a comprehensive technical inspection of the dike annually.



John F. Cysz
Project Manager
MA P.E. No. 28841

This Phase I Inspection Report on Congamond Lakes North Dike has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of the Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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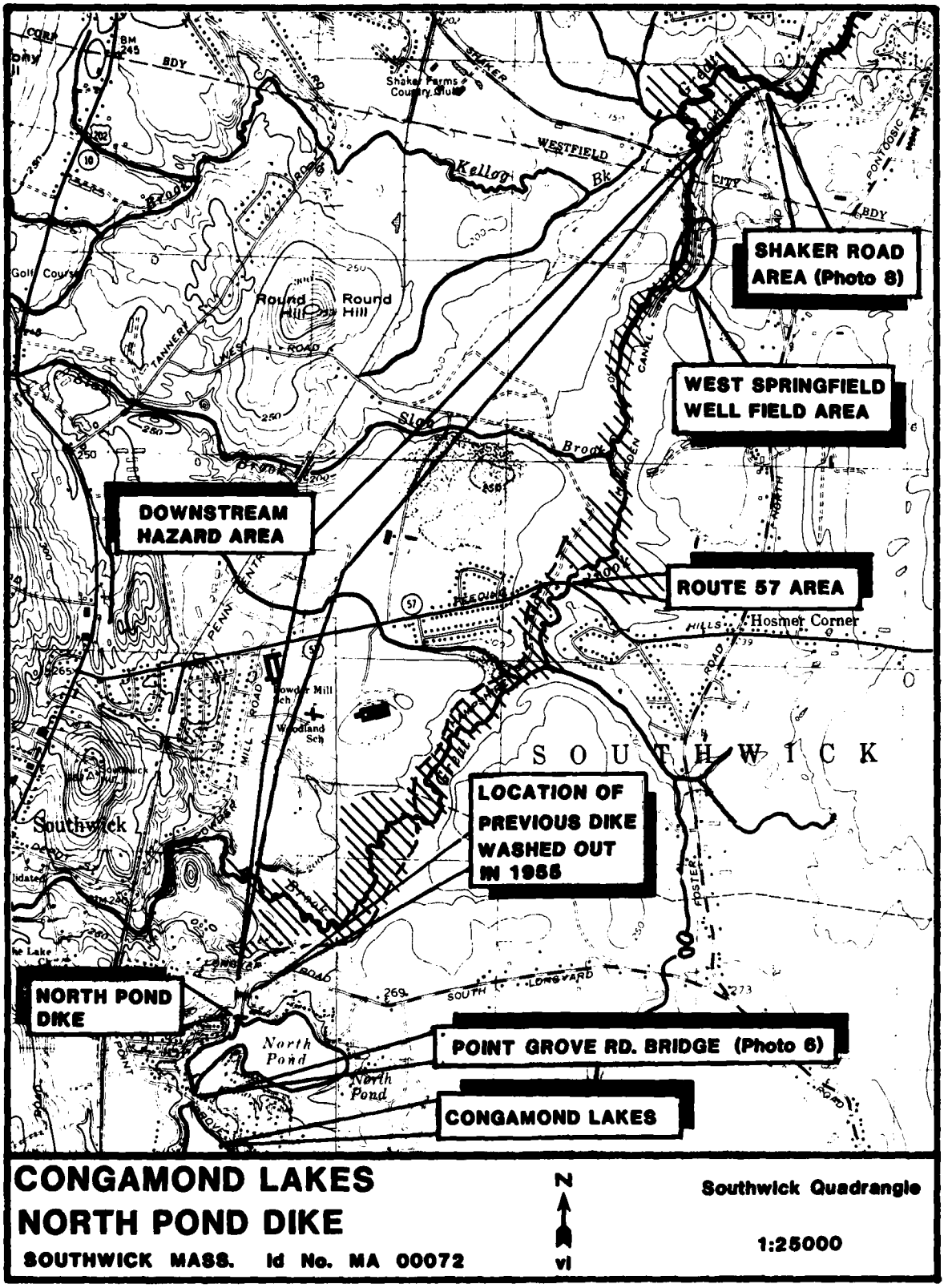
OVERVIEW OF

CONGAMOND LAKES - NORTH DIKE



CONGAMOND LAKES
NORTH POND DIKE
SOUTHWICK MASS. Id No. MA 00072

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
CONGAMOND LAKES - NORTH DIKE
SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Robert G. Brown & Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the Commonwealth of Massachusetts. Authorization and notice to proceed were issued to Robert G. Brown & Associates, Inc. under a letter of 14 March 1980 from William E. Hodgson, Colonel, Corps of Engineers. Contract No. DACW33-80-C-0037 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

(1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) To encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of dams.

1.2 DESCRIPTION OF PROJECT

a. Location

Congamond Lakes North Dike is located in the Town of Southwick, Massachusetts. The dike impounds North Pond which is one of the three interconnected recreational bodies of water which make up the Congamond Lakes. The dike provides closure at the former location of the Farmington Canal which utilized the Congamond Lakes as part of its route in the 1830's and 40's. Congamond Lakes North Dike is shown on the USGS Southwick, Mass.- Conn. Quadrangle at Latitude 42° 02.8', and Longitude 72° 45.4'.

b. Description of Dike and Appurtenances

Congamond Lakes North Dike impounds North Pond which is one of the ponds which make up the Congamond Lakes. All of the three ponds, North Pond, South Pond and Middle Pond, are interconnected by culverts or bridges. Together, the three ponds are approximately three miles long and up to one-third mile wide with a total surface area of about 465 acres.

The North Dike was constructed to replace an earlier dike (which plugged an old canal) and which failed in 1955.

The North Dike is approximately 80 feet long with a maximum height of 29 feet. An unpaved road passes over the top of the dike in an east/west direction. The top width of the dike is approximately 60 feet at elevation 234 MSL. The upstream face has a slope of about 9 percent to a height about 7 feet above the normal water level (elevation 225 MSL), at which point the slope flattens to about 3 percent to the top of the dike which is about 8 feet above the normal water level. The downstream slope is covered by a trash dump and could not be inspected.

There is no spillway nor regulating gates at North Dike. The present outlet for the lakes is at Middle Pond where Berkshire Avenue crosses Great Brook about 2 miles to the south of North Dike. During annual floods the direction of flow in Great Brook reverses itself and flows back towards Congamond Lakes. The outlet structure at Berkshire Avenue has stoplogs which are inserted to prevent Great Brook from flooding back into the lakes. While the stoplogs are in-place, Congamond Lakes has no outlet. After the flood stage of Great Brook recedes (usually within 12 hours), the stoplogs are removed and Congamond Lakes are allowed to drain.

c. Size Classification

The dike is 29 feet high and has a storage capacity greater than 12,600 acre-feet, therefore it is classified as "intermediate" size, based on storage (1000 to 50,000 acre-feet) as given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The dike is in a high hazard category because a major breach could cause appreciable damage to roads and bridges in the downstream area and loss of more than a few lives would be likely. A well field which serves the Town of West Springfield could be damaged by flooding.

e. Ownership

The ownership of the dike is unclear. After the failure of the previous dike in 1955 a new dike was built by the Commonwealth of Massachusetts Division of Waterways under a flood relief program.

All subsequent inspection reports prepared by the Hampden County Commissioners and the Massachusetts Department of Public Works were addressed to the Board of Selectmen of the Town of Southwick, Southwick, Massachusetts, who were identified as the owners. In response to these reports, the Town of Southwick performed minor maintenance on the dike.

According to current assessors' records, the land on which the dike was constructed is presently owned by the Trustees of Northeast Land Development Trust, 45 Warwick Street, Springfield, MA, Telephone: (413) 781-5500.

The present trustees are reported to be: William R. Robbins, Edward R. Robbins, and Ryland E. Robbins.

f. Operator

There are no operating mechanisms or operational procedures associated with Congamond Lakes North Dike. The Town of Southwick has in the past performed minor maintenance of the dike. The outlet structure for the Congamond Lake system at Berkshire Avenue is operated by the Town of Southwick Highway Department under the direction of the Southwick Board of Selectmen.

g. Purpose of Dam

The North Dike replaced an earlier dike at the location where the former Farmington Canal joined the Congamond Lakes. The North Dike forms a plug in the old canal bed. A similar earth dike at South Pond serves the same purpose. All three of the water bodies which make up the Congamond Lakes are used for recreation.

1.3 PERTINENT DATA

a. Drainage Area

The total drainage area contributing to Congamond Lakes is 4.2 square miles. The watershed consists of 465 acres of water surface area (at normal lake level) and about 2220 acres of surrounding area which drains directly to the lake.

The watershed around the Congamond Lakes is essentially very flat. The topography generally rises abruptly along the lake shore then flattens out to form a relatively level plain. The terrain rises again along the watershed divide which is formed by a series of ridges and drumlins that rise above the plain. Soils in the watershed are predominently deposits of stratified drift with tills appearing along the boundary.

Development in the watershed is concentrated mainly along the lake shore. Land use within the drainage area is approximately 20 percent developed, 60 percent undeveloped and agricultural, and 20 percent open water.

b. Discharge at Damsite

There is no discharge of water in the vicinity of North Dike. North Pond is connected to Middle Pond at Point Grove Road by a box culvert about 7 feet high and 8.3 feet wide. The invert of the box culvert is approximately elevation 223 MSL or about 2 feet below the normal lake level. At present there is sediment layer about 1 foot thick on the culvert bottom. This box culvert acts as an equalizing conduit between North Pond and Middle Pond.

The present outlet for the Congamond Lakes is at Middle Pond where Berkshire Avenue crosses Great Brook. The outlet structure consists of two box culverts, each approximately 8.4 feet wide and 5.5 feet high. The inverts of the box culverts are at elevation 223.5 MSL and the top of the openings are at 229.0 MSL. A concrete sill on the bottom of the box culverts is at elevation 224.6 MSL. The top of the concrete curb on the road above the box culverts is about 231.7 MSL. Stop log slots on the upstream end of the box culverts provide a means of blocking the openings to prevent Great Brook from backing up into the Congamond Lakes during periods of flood. During the period while the stop logs are in-place (usually less than 12 hours), there is no outlet for Congamond Lakes.

The Division of Waterways is currently engaged in evaluating a proposal to create an additional outlet for the Congamond Lakes, either at North Pond or other locations.

(1) Outlet works - There are no outlet works at North Dike. (A concrete box culvert 7' high by 8.3' wide connects North Pond with Middle Pond at Point Grove Road.)

(2) Maximum flood at damsite - Previous dike failed in 1955 with water at approximate elevation 229.3 MSL.

(3) Ungated spillway capacity at top of dike - Not applicable.

(4) Ungated spillway capacity at PMF test flood elevation - not applicable.

(5) Gated spillway capacity at normal pool elevation - not applicable.

(6) Gated spillway capacity at test flood elevation - not applicable.

(7) Total spillway capacity at test flood elevation - not applicable.

(8) Total project discharge at top of dike- not applicable.

(9) Total project discharge at test flood elevation - 690 cfs. (Capacity of Box Culverts at Berkshire Avenue with stoplogs removed.)

c. Elevation (Note: Datum is feet above sea level NGVD referred to in text as MSL)

(1) Streambed at toe of dike - 205 MSL. Bottom of 30'± deep washout eroded by 1955 failure of previous dike.

(2) Bottom of cutoff - none.

(3) Maximum tailwater - unknown.

(4) Normal pool - 225 MSL by USGS Quadrangle.

(5) Full flood control pool - not applicable.

(6) Spillway crest - not applicable, (top of concrete sill at Berkshire Avenue outlet structure 224.6 MSL).

(7) Design surcharge - unknown.

(8) Top of Dike - 234 MSL as built, 232 MSL per 1956 plan. (Top of South Dike and Berkshire Avenue Bridge both at 232± MSL, maximum impoundment elevation.)

(9) PMF test flood surcharge - 232 MSL.

d. Reservoir (length in feet)

(1) Normal pool - 16,000 (total of North, Middle and South Ponds).

(2) Flood control pool - not applicable.

(3) Spillway crest pool - 15,900.

(4) Top of dike - not applicable (16,300 @ 232 MSL)

(5) Test flood pool - 16,300.

e. Storage (acre-feet)

(1) Normal pool - 8,500 (Total Volume of Congamond Lakes).

(2) Flood control pool - not applicable.

(3) Spillway crest pool - 8,300 (Total Volume of Congamond Lakes below 224.6 MSL).

(4) Top of dike - not applicable (12,600 @ 232 MSL)

(5) Test flood pool - 12,600.

f. Reservoir Surface (acres)

(1) Normal pool - 465 @ 225 MSL.

(2) Flood control pool - not applicable.

(3) Spillway crest pool - 450 @ 224.6 MSL.

(4) Top of dike - not applicable (725± @ 232 MSL)

(5) Test flood pool - 725 (estimated).

g. Dam

(1) Type - Dike is an earth embankment.

(2) Length - 80 feet.

(3) Height - 29 feet.

(4) Top width - 60 feet @ 234 MSL.

(5) Side slopes - upstream slope 9% to elevation 232 MSL.
3% between 232 MSL and 234 MSL.
- downstream slope 2H:1V trash dump.
3H:1V by design.

(6) Zoning - none.

(7) Impervious core - none.

(8) Cutoff - none.

(9) Grout curtain - none.

(10) Other - 10' wide unpaved road @ 235 MSL on top of dike.

h. Diversion and Regulating Tunnel - not applicable.

i. Spillway
   (1) Type - no spillway at North Dike. Outlet structure for Congamond Lakes is on Middle Pond 3 miles south of North Dike. Outlet is twin box culvert bridge under Berkshire Avenue.

   (2) Length of weir - not applicable. (16.8' width of box culverts (two openings each at 8.4 feet) at Berkshire Avenue outlet structure.)

   (3) Crest elevation - not applicable. (224.6 MSL top of concrete sill at bottom of box culverts at Berkshire Avenue.)

   (4) Gates - none.

   (5) U/S Channel - North Pond is upstream of North Dike.

   (6) D/S Channel - 30 foot deep gully formed by breach of previous dike in 1955. Gully has been partially filled-in with trash.

j. Regulating Outlets
   (1) Invert - not applicable. There are no regulating outlets.

   (2) Size - not applicable.

   (3) Description - The surface level of Congamond Lakes cannot presently be regulated. The normal surface level is controlled by a concrete sill at the bottom of the box culverts at the Berkshire Avenue outlet. During floods,stop logs are placed to block the box culvert openings in order to prevent Great Brook from backing up into Congamond Lakes. While the stop logs are in-place, there is no outflow from the lakes and the lake level rises. After the stage of Great Brook recedes, the stop logs are removed and Congamond Lakes are allowed to drain. The estimated capacity of the Berkshire Avenue outlet without stop logs is 690 cfs with water at elevation 232 MSL.

   The Division of Waterways is currently engaged in evaluating a proposal to create an additional outlet for the Congamond Lakes, either at North Pond or other locations.

   (4) Control Mechanism - none.

SECTION 2
ENGINEERING DATA

2.1 DESIGN DATA

Plans and specifications for construction of a new dike at North Pond to replace the dike which failed in 1955 are available from the Commonwealth of Massachusetts, Division of Waterways in Boston. The plans are dated September 1956 and were prepared by Charles T. Main, Inc. (Contract no. 1659)

A report by Charles T. Main, Inc. relative to the 1955 flood and reconstruction of the dikes and outlet for Congamond Lakes is also available.

2.2 CONSTRUCTION DATA

Records for the 1956-75 dike construction are available from the Division of Waterways.

2.3 OPERATION DATA

There are no operating mechanisms or operational procedures associated with Congamond Lakes North Dike. The stop logs at the Berkshire Avenue outlet are installed and removed by the Southwick Highway Dept. under the direction of the Board of Selectmen. The water level in Great Brook and Congamond Lakes is observed by Highway Dept. personnel during heavy rains.

2.4 EVALUATION OF DATA

a. Availability

Existing information was made available by the Division of Waterways, and the Town of Southwick Board of Selectmen. The landowners revealed no data regarding the dike.

In 1976-77 a proposal was made by the Division of Waterways to construct a drop inlet spillway at North Dike in order to provide a more constant lake level. Plans (12 sheets) for this proposal (Contract No. 2880) were prepared by Robert G. Brown & Associates, Inc. in August of 1977. The proposal has not been implemented pending legal studies and environmental assessments. The Division of Waterways has retained the firm of Jason M. Cortell & Associates, Inc. to prepare an Environmental Impact Report, a draft of which was completed in March of 1980.

b. Adequacy

The final assessments and recommendations of this investigation are based primarily on the visual inspection, hydraulic and hydrologic calculations, past performance history, and sound engineering judgment.

c. Validity

In general, the information obtained from available plans, correspondence and reports is consistent with observations made during the inspection and is therefore considered reliable.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General

Congamond Lakes North Dike was inspected on June 6, 1980. The weather was clear and sunny. The water level of the Congamond Lakes was at elevation approximately 225.2 MSL which is about 9 feet below the top of dike. The entire upstream face above the water line was visible during the inspection. The downstream face and toe of the dike is covered by a trash dump and was not visible for inspection.

b. Dam

Congamond Lakes North Dike is an earth embankment about 80 feet long and 60 feet wide at the top (elevation 234 MSL). The dike was built both higher and wider than called for in the 1956 reconstruction plans. The embankment was constructed with compacted, silty sand fill obtained nearby. (See Appendix B.)

A 10 foot wide sand and gravel access road passes over the dike in an east/west direction.

The upstream face of the dike above the lake level is largely unvegetated and has deep erosion gullies (see Appendix C, Photograph 2). Because of the massiveness of the dike and its wide top width, this condition does not immediately jeopardize the dike; however, the gullies should be repaired and the entire upstream face should be vegetated, or otherwise made resistent to erosion. Trespassing on the upstream slope should be prevented or else a surface treatment should be designed to withstand passage of vehicles without causing damage or erosion of the embankment. Surface drainage from the road passing over the dike should be collected and carried to the lake in a lined drainage swale or conduit.

Riprap was noted along the reservoir on the upstream face. Most of this riprap is dislodged and displaced. Repairs to the riprap should be designed and implemented.

The downstream face of the dike is being used as a trash dump and is therefore not visible. Trees are growing out of the downstream slope. All trees and trash should be removed from the downstream face of the dam and proper vegetation or other surface treatment should be provided. This will facilitate future inspection.

The 10 foot wide sand and gravel road at the top is about 1 foot higher than the surrounding top of dike.

A water pipe passes across the dike to provide service to cottages along the westerly abutment. The depth of this water pipe is not known. There is a possibility that a now discontinued water pipe also exists in the embankment.

c. Appurtenant Structures

There are no appurtenant structures associated with Congamond Lakes North Dike. The box culvert which connects North Pond with Middle Pond at Point Grove Road is in satisfactory condition. (See Appendix C, Photograph 6.) The present concrete box culvert at this location was constructed in 1956 by the Massachusetts Department of Public Works. The concrete box culvert was later extended on the Middle Pond side with a section of corrugated steel pipe arch. When North Dike failed in 1955, the culvert at Point Grove Road was blocked by the Town of Southwick Highway Department and drainage of Middle Pond was prevented.

According to the Southwick Selectmen, the emergency dam at Point Grove Road held and therefore downstream damage caused by failure of the dike was minimized.

d. Reservoir Area

Congamond Lakes is comprised of three interconnected ponds, North Pond (46 acres) Middle Pond, (277 acres) and South Pond (142 acres).

The total length of shoreline is approximately 9 miles of which about 85% is developed for residential or commercial use.

There are approximately 12 structures around the Congamond Lakes which experience seasonal flooding problems due to water level fluctuations.

e. Downstream Channel

The channel immediately downstream of North Dike was washed out about 20 to 30 feet deep when the previous dike failed in 1955 as a result of Hurricane Diane. The previous dike plugged the old Farmington canal about halfway between North Pond and South Longyard Road. The present channel is about 40 feet deep, 20 to 50 feet wide at the bottom with 2H:1V side-slopes. Much of the channel bottom and slopes have been covered with trash, demolition materials, old appliances and an automobile body. South Longyard Road is located approximately 600 feet downstream of North Dike. It was reconstructed after the washout and now crosses a 20 foot high embankment, the top of which is about the normal water level in the lakes. There is a 48-inch reinforced concrete culvert under the road at this location.

A home is located on the east side of the washout channel about 1300 feet downstream of North Dike. The channel flattens and widens onto the Great Brook floodplain before joining Great Brook about 2200 feet downstream of the dike. The elevation of Great Brook at this confluence is about 175 MSL which is approximately 50 feet lower than the normal water level in Congamond Lakes.

3.2 EVALUATION

Visual observations made during the course of the investigation revealed several deficiencies which at present do not adversely affect the adequacy of the dike. However, these deficiencies do require attention and should be corrected before further deterioration leads to a hazardous condition. Recommended measures to improve these conditions are given in Section 7. The present condition of the dike is assessed as fair.

The major deficiencies noted during the investigation are, in general:

- Deep erosion gullies and displaced riprap on the upstream face of the dike.

- Trash on the downstream face of the dike which prohibits proper inspection of the embankment.

- Trees and brush growing on the downstream face of the dike.

SECTION 4
OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General

There are no operational mechanisms or procedures associated with North Dike. The outlet for Congamond Lakes is at Middle Pond where Berkshire Avenue crosses Great Brook about 2 miles south of North Dike. The flat channel gradient causes Great Brook to flow back into Congamond Lakes during flood periods. In order to prevent this condition, stop logs are inserted in the outlet structure. While the stop logs are in-place (usually less than 12 hours), there is no outflow from Congamond Lakes. After the stage of Great Brook recedes, the stop logs are removed by the Town of Southwick Highway Department under the direction of the Board of Selectmen.

b. Description of any Warning System in Effect

There is no formal warning system in effect. Prior to failure of the dike in 1955, homes downstream were evacuated in time to prevent loss of life although two homes were totally destroyed.

4.2 MAINTENANCE PROCEDURES

a. General

There is no formal maintenance manual for the project. It is apparent that no routine maintenance on North Dike is performed. The Town of Southwick Highway Department has in the past performed minor maintenance even though responsibility for maintenance of the dike is unclear.

b. Operating Facilities

There are no mechanisms which require operation at the project site.

4.3 EVALUATION

The ownership of the dike and responsibility for its safety and maintenance should immediately be studied and determined by the landowner, the Town of Southwick, and the Commonwealth of Massachusetts, Division of Waterways.

A formal written and maintenance plan, including an annual comprehensive technical inspection by a qualified Registered Professional Engineer, should be developed to insure that problems that are encountered can be remedied within a reasonable period of time. A formal written surveillance and downstream warning (emergency preparedness) plan should be established for this structure.

SECTION 5
EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The total drainage area contributing to Congamond Lakes is 4.2 square miles. The watershed consists of 465 acres of water surface area (at normal lake level) and about 2220 acres of surrounding area which drains to the lake by a number of short tributaries.

The watershed around the Congamond Lakes is very flat. The topography generally rises abruptly along the lake shore then flattens out to form a relatively level plain. The terrain rises again along the watershed divide which is formed by a series of ridges and drumlins that rise above the plain. Soils in the watershed are predominently deposits of stratified drift with tills appearing along the boundary.

Development in the watershed is concentrated mainly along the lake shore. Land use within the drainage area is approximately 20 percent developed, 60 percent undeveloped and agricultural, and 20 percent open water.

5.2 DESIGN DATA

Plans and specifications for replacement of North Dike after failure of an earlier dike in 1955 are available from the Massachusetts Department of Public Works, Division of Waterways in Boston. The plans are dated May 1956 and were prepared by Charles T. Main, Inc.

A report by Charles T. Main, Inc. relative to the 1955 flood and reconstruction of the dikes and outlet for Congamond Lakes is also available.

In 1976-77 a proposal was made by the Commonwealth of Massachusetts, Division of Waterways to construct a drop inlet spillway at North Dike in order to provide a more constant lake level. Plans (12 sheets) for this proposal were prepared for the Division of Waterways by Robert G. Brown & Associates, Inc. in August of 1977. The proposal has not been implemented pending legal studies and environmental assessments. The Division of Waterways has retained the firm of Jason M. Cortell & Associates, Inc. to prepare an Environmental Impact Report, a draft of which was completed in March of 1980.

5.3 EXPERIENCE DATA

The present dike at North Pond is a replacement for the dike which failed as a result of Hurricane Diane in 1955. According to a report of the 1955 flooding, prepared by Charles T. Main, Inc. in May of 1956, (see Appendix B) the water level in North Pond at the time of failure was 229.3 MSL. The dike failed by

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* Numbers denote references in back of Section 5.

overtopping and erosion of the embankment. Two homes and South Longyard Road were destroyed and a municipal well field was damaged. There was no loss of life since advance warning was made to downstream residents and the structures were evacuated. Further downstream damage was prevented as a result of action taken to plug the culvert between North Pond and Middle Pond at Point Grove Road, thereby containing additional flood waters.

The Charles T. Main report concluded that the level of the lakes continued to rise after the end of the run-off producing rain. This indicates the effects of groundwater inflows into the lakes.

During the 1955 hurricane, Great Brook, downstream of Berkshire Avenue, reached an elevation of about 231.5. This caused Great Brook to flow back into the Congamond Lakes.

After the 1955 event, the present outlet at Berkshire Avenue was constructed to provide a means of preventing the entry of Great Brook during times of flood.

5.4 TEST FLOOD ANALYSIS

Congamond Lakes North Dike is classified as intermediate size, having a hydraulic height of 29 feet and a storage of 12,600 acre-feet. The dike was determined to have a high hazard classification. Using the Recommended Guidelines for Safety Inspection of Dams, the test flood is the Probable Maximum Flood (PMF).

The Probable Maximum Flood (PMF) was estimated by assuming that the outlet at Berkshire Avenue is closed off by stop logs and that the outlet structure is functioning as designed. Under the design condition there is no outflow from the Congamond Lakes and all flow into the lakes is stored. Flow into the lakes was assumed to be comprised of direct rainfall on the lake surface, direct run-off into the lakes from the surrounding watershed, and groundwater inflow.

The 24-hour Probable Maximum Precipitation (PMP) was estimated to be 27.84 inches using charts presented in Hydrometeorological Report No. 33, prepared by the Hydrometeorological Branch of the National Weather Service in collaboration with the U.S. Corps of Engineers.[1] Because the drainage area is less than 10 square miles, the Corps of Engineers allows the H.R. No. 33 values to be reduced by 20 percent as stated in Engineering Circular No. 1110-2-27.[2] Therefore the 24-hour PMP was estimated to be 22.27 inches. (Hurricane Diane, August 18-19, 1955 reportedly brought about 18 inches of rainfall to the area.)

Based on soil types in the watershed, it was estimated that 17.0 inches of direct run-off would be produced from the watershed.

Groundwater inflow was estimated to average 100 cfs for the 24-hour period.

The lake level at the start of the rainfall was assumed to be 225 MSL.

The elevation of the Probable Maximum Flood (PMF) as a result of direct rainfall on the lake (without losses), direct runoff, and groundwater inflow, was estimated to be elevation 232 MSL. This level corresponds with the design

elevation for the top of North Dike according to the 1956 reconstruction plan. The actual top elevation of North Dike is about 2 feet higher than this elevation.

It should also be noted that the PMF elevation is close to the top of the road above the outlet structure at Berkshire Avenue and is also close to the maximum level observed in Great Brook during the 1955 flood.

5.5 DAM FAILURE ANALYSIS

The impact of failure of the dam was assessed using Corps of Engineers "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs. The estimate in this case assumes:

(a) the lake surface is at 232 MSL (test flood elevation) at the time of the breach.

(b) a breach of 40% of the dike length at mid-height occurs (24 feet).

The total volume of Congamond Lakes at elevation 232 MSL (top of South Dike and Berkshire Avenue Bridge is estimated to be 12,600 acre-feet). In the event of a breach in the dike, the water in Middle Pond could be contained at Point Grove Road by a natural high point (elevation 223 MSL) in the lake bottom separating North Pond and Middle Pond. Under this condition the volume subject to drainage by a breach at North Dike would be the stored volume of North Pond and the stored volume of Middle Pond and South Pond above about elevation 223 MSL. This volume would be approximately 6000 acre-feet.

The estimated discharge resulting from the breach would be approximately 4450 cfs. South Longyard Road, 600 feet downstream of the dike, would be washed out. 1300 feet downstream of the dike the breach would cause a flood wave height of about 8 feet. One house in this area could be severely damaged or destroyed. Prior to failure there would be no significant flow in the channel immediately downstream of the dike.

The flood wave would then flow into Great Brook. Antecedent flows in Great Brook were assumed to be comparable to the 1/4 PMF as estimated by Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations, issued by the New England Division Corps of Engineers.

Where Great Brook crosses Feeding Hills Road (Route 57) about 1.7 miles downstream, the road would be overtopped by about 1 foot by antecedent flows. Flow resulting from the breach would cause an estimated additional 3 feet of overtopping which could cause flooding of about 3 structures in the area.

At the point where Shaker Road crosses Great Brook about 3 miles downstream, there are two 15 foot wide arch culverts. Antecedent flows would overtop the low point in the road by about 2 feet. Flow from the breach could

cause an additional 2 to 3 feet of overtopping, thereby possibly flooding newly built homes in this area. An estimated 6 to 10 homes in the Shaker Road area could be flooded by 1 to 3 feet of water under the assumed conditions.

Contamination and other damage to the well field which serves the Town of West Springfield would be likely.

Because of the potential for damage or interruption of public services, and possible damage or destruction of private property and the possibility for the loss of more than a few lives, the structure is classified as High Hazard.

REFERENCES

1/ National Weather Service, Hydrometeorological Branch; Report No. 33, "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24, and 48 Hours," 1956.

2/ U.S. Corps of Engineers; Engineer Circular No. 1110-2-27, dated August 1, 1966, "Policies and Procedures Pertaining to Determination of Spillway Capacities and Freeboard Allowances for Dams."

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS

The most significant visual observation related to the structural aspects of this dike is the deep gullies caused by erosion on the upstream face. Also the presence of a trash dump on the downstream face of the dike is inappropriate for this type of structure and prohibits proper inspection of the embankment.

Other deficiencies are described in Section 3. Recommendations to improve these deficiencies are given in Section 7.

6.2 DESIGN AND CONSTRUCTION DATA

No design computations pertaining to the structural stability of the dike have been located. Based on the visual inspection, it appears that the dike was constructed both higher and wider than called for by the 1956 reconstruction plans.

6.3 POST-CONSTRUCTION CHANGES

There do not appear to be any post-construction changes other than maintenance of the unpaved road which crosses the dike.

6.4 SEISMIC STABILITY

The dike is located in Seismic Zone No. 2, and in accordance with Recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition

Based on engineering judgment and the past performance of the dike, the project appears to be in fair condition. The project, however, does have inadequacies and deficiencies which, if not remedied, have the potential for developing into hazardous conditions.

b. Adequacy of Information

Available data cited in previous sections where reviewed, including previous inspection reports prepared by the Massachusetts Department of Public Works and the Hampden County Engineer. Available information is considered adequate for the purposes of the Phase I investigation.

c. Urgency

The recommendations made in 7.2 and 7.3 should be implemented by the owner within 1 year after receipt of this Phase I Inspection Report.

7.2 RECOMMENDATIONS

The ownership of the dike and responsibility for its safety and maintenance should immediately be studied and determined by the Commonwealth of Massachusetts.

The owner should engage a qualified Registered Professional Engineer to:

(1) Design an erosion resistent surface for the upstream face. A means to carry surface runoff from the upstream face of the dike and the road at the top of the dike should be included in this design.

(2) Design repairs to the displaced riprap.

(3) Design and supervise procedures to clear the downstream face of the dike of trees and trash in a manner which will not compromise the stability of the slope. Trees and trash should be removed for a distance of at least 100 feet beyond the toe of the slope.

(4) Design an erosion resistent surface on the downstream embankment slope.

The owner should implement all the Engineer's recommendations.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures

The owner should:

(1) Repair erosion gullies on the upstream face of the dike.

(2) Establish a formal written maintenance program including comprehensive technical inspection by a qualified Registered Professional Engineer annually.

(3) Establish a formal written surveillance and downstream warning (emergency preparedness) plan.

7.4 ALTERNATIVES

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

DAM: Congamond Lakes North Dike MA 00072

DATE: 6 June 1980

TIME: 3:30 p.m.

WEATHER: Clear, sunny

W.S. ELEV. 225.3 U.S. Dry gully @ 205 DN.S.

ELEV. DATUM: TBM - Railroad spike in Oak stump at east abutment elevation 232.5 MSL.

INSPECTION PARTY:

1. J. F. Cysz, P.E.
2. K. N. Hendrickson, P.E.
3. J. E. Walsh, P.E., (Baystate Environmental Consultants, Inc.)
4. L. D. Zwingelstein
5. H. T. Shumway
6. _____

Note: All project features inspected by all party members.

OTHERS PRESENT DURING INSPECTION:

1. _____
2. _____
3. _____
4. _____

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
DAM EMBANKMENT	Includes entire dike
Crest Elevation	234 MSL top of dike, 235 MSL top of gravel road.
Current Pool Elevation	225.3 MSL
Maximum Impoundment to Date	1955 embankment overtopped with water at 229.3 MSL.
Surface Cracks	None
Pavement Condition	No pavement
Movement or Settlement of Crest	Deep gullying caused by erosion - poor vegetaion
Lateral Movement	None observed
Vertical Alignment	OK
Horizontal Alignment	OK
Condition at Abutment and at Concrete Structures	No concrete structures
Indications of Movement of Structural Items on Slopes	Downstream face not visible - trash dump on downstream face.
Trespassing on Slopes	Yes - auto traffic, trail bikes, water pipe
Vegetation on Slopes	Poor on upstream face
Sloughing or Erosion of Slopes or Abutments	Yes - 3' wide 2' deep gully on upstream face.
Rock Slope Protection - Riprap Failures	Displaced, scattered riprap on upstream face near lake level.
Unusual Movement or Cracking at or near Toes	Toe not visible because of trash dump.
Unusual Embankment or Downstream Seepage	Wet area downstream of dike in trash dump.

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
DAM EMBANKMENT (cont'd.)	
Piping or Boils	None observed, downstream area is buried in trash.
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None
Other	Water line through embankment serves cottages near west abutment.

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	No outlet works at this site
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	No control tower or operating mechanisms at this site.
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Gloat Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	No outlet works at this site. Division of Waterways has proposed a future drop inlet spillway and outlet conduit.
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	No outlet works at this site.
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	No spillway at this site
a. Approach Channel	
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel	
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Channel	
Other Obstructions	

VISUAL INSPECTION CHECKLIST

DAM: Congamond Lakes North Dike MA 00072 DATE: June 6, 1980

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	No service bridge at this site
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

ENGINEERING DATA

B-1. LIST OF AVAILABLE DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS

B-2. PREVIOUS INSPECTION REPORTS

B-3. PLANS, SECTIONS AND PROFILES

B-4. BORING LOGS

LIST OF AVAILABLE DESIGN

CONSTRUCTION AND MAINTENANCE RECORDS

A. Plans and Specifications entitled: "Proposed Repair of Closure Dikes and Construction of New Spillway, Congamond Lakes, Southwick," 3 sheets, Department of Public Works, Division of Waterways, September 1956, prepared by Charles T. Main, Inc. with Division of Waterways, 100 Nashua Street, Boston, MA 02114.

B. Plans (12 sheets) entitled "Proposed Outlet Works, Congamond Lakes, Southwick, MA, Department of Environmental Quality Engineering, Division of Waterways, August 1977, Contract No. 2880," prepared by Robert G. Brown & Associates, Inc., Pittsfield, MA. On file with Division of Waterways. These plans are for a proposed overflow outlet at North Dike. The proposal is currently in the process of environmental and legal studies.

C. "Draft Environmental Impact Report, Flood Control Works, Congamond Lakes, Southwick, MA, Department of Environmental Quality Engineering, Division of Waterways, March, 1980," prepared by Jason M. Cortell & Associates, Inc., Waltham, MA. On file with Division of Waterways.

D. "Studies Made Relative to Providing a New Outlet for Congamond Lakes, Southwick, MA," prepared for the Division of Waterways by Charles T. Main, Inc., Boston, MA, dated May 8, 1956. On file with Division of Waterways. Copy of study follows Appendix B-1.

E. Design records were not made available.

F. Construction records are available from the Division of Waterways.

G. No maintenance records were available, except through interview of Southwick Town Officials.

APPENDIX B-1

CHAS. T. MAIN, INC.
80 FEDERAL STREET
BOSTON 10, MASS.

May 8, 1956

167-73

Subject: Congamond Lakes
Study of Outlet

Commonwealth of Massachusetts
Department of Public Works
Division of Waterways
100 Nashua Street
Boston, Massachusetts

Gentlemen:

We submit herewith a report on studies we have made relative to providing a new outlet for Congamond Lakes in Southwick, Mass. These studies were made pursuant to Contract No. 1566, dated Jan.9, 1956, and received by us on March 6, 1956.

Briefly, we conclude that the lakes should be restored by construction of an earth dike plug in the north outlet, that the dike at the south end should be raised and strengthened, that the present outlet into Great Brook should be replaced with a larger and more substantial structure, and that the roadway forming the restraining dike at the Great Brook outlet should be raised. Our proposals are described as Alternative No. 1 of the report and are shown on Plate VI. The estimated cost is $51,500.

Regarding the channel of Great Brook, we conclude that no major program of improvement is warranted at this time.

We believe that the report covers all points about which there might be any question. Please do not hesitate to call on us, however, should you feel that elaboration of any part is necessary.

Yours very truly,

CHAS. T. MAIN, INC.

By

C. C. Cullen, retired

CCC:j

Paul Johnson still here
Jack Goodrich " "

REPORT ON

STUDIES MADE RELATIVE TO PROVIDING
A NEW OUTLET FOR CONNECTED LAKES
SOUTHWICK, MASS.

INDEX

167-73-1

REPORT ON

STUDIES MADE RELATIVE TO PROVIDING
A NEW OUTLET FOR CONGAMOND LAKES
SOUTHWICK, MASS.

1. GENERAL. - Congamond Lakes, in the town of Southwick, Mass., comprise three interconnected ponds having a total surface area of about 440 acres. The lakes lie approximately in a north and south direction, about three miles long and up to one-third of a mile wide. The eastern shore forms, generally, the State boundary of the Massachusetts panhandle into Connecticut. The lakes were at one time part of the Hampshire & Hamden Canal, with entrances at the extreme north and south ends. Upon abandonment of the canal, these outlets were plugged with earth dikes.

The natural outlet of the lakes, called Great Brook, emerges westward from the southern end of the middle pond, flows generally northward, circles around the north end of the lakes and discharges about 5 miles northeastward into the Westfield River. The channel is restricted in several places by culverts. The present outlet from the lakes is a severe restriction, consisting only of a 36" x 58" corrugated iron culvert. A considerable drainage area feeds the brook from the westward and it is this area that contributes to flooding of the channel rather than any outflow from the lakes.

During the hurricane storm of August 18-19, 1955, there were two separate occurrences, both related to the storm but having little relation to each other, which caused property damage in the area.

First, during the height of the storm, the channel of Great Brook became gorged with water and flooded to a varying degree some six establishments - 4 private dwellings (one destroyed), a convalescent home and a filling station - along its banks and a tributary brook. The lake thus formed finally broke through the railroad fill which formed the dam and was relieved. There was some damage to highway culverts and fills where these were overtopped.

Second, the Lakes, as is usual, continued to rise after the rainfall had ceased. Some six hours after the run-off producing rain had stopped, water began overtopping the plug in the north outlet. Efforts to stop this were not successful and about nine hours later the entire north pond went out, cutting an immense gorge out to the channel of Great Brook. The highway culvert connecting Middle Pond and North Pond was sealed off so that only North Pond was drained.

2. SCOPE. - This report is principally concerned with measures for sealing off the lakes and providing means so that the outflow can be carried away in a safe and dependable manner. As a coordinate problem, a study was made of the inflows to Great Brook other than from

the Lakes, and of the carrying capacity of Great Brook Channel, both up to a point opposite the north end of the lakes. No study has been given to the channel between this latter point and the confluence with Westfield River.

The storm of August 18-19, 1955 so greatly exceeded all previous records for the entire eastern part of the country that design of hydraulic structures in general for worse conditions is not considered either reasonable or economical. The storm is, therefore, taken as a criterion for the study. Whenever conditions during the August 1955 storm are described, it can be taken that they apply equally to the "design storm".

3. PROPOSED WORKS

(a) Great Brook Channel. - The following conditions obtain in Great Brook Channel during a flood comparable to that of Aug. 19, 1955. They are illustrated on a profile of the Channel, Plate II.

1. Flooding of the Channel is caused by insufficient culvert capacity.

2. The culvert under the N.Y., N.H., & H. Railroad tracks is the controlling restriction. This culvert is reported to have been partially obstructed by debris during the flood of August 1955 but the effect of the obstruction was apparently minor. The high railroad embankment effectively dammed the stream for a time and backed water over Point Grove Road to such a depth that the roadway culvert and embankment were a very minor obstruction.

3. The Point Grove Road culvert becomes a controlling restriction, if the railroad restriction is remedied. A storm equivalent to that of August 1955 would put water running about 2.5 feet deep over the roadway surface.

4. The channel of Great Brook, although overgrown, is sufficiently wide to cause no appreciable obstruction to flows level with Point Grove Road. Flows below this level should cause no damage. El 224.5 = top road

5. During times of great storms, the conditions in Great Brook should be aggravated as little as possible by outflow from the Lakes. This has unquestionably been the past condition. The outlet has always been restricted to such an extent that the main part of the lake inflow has been stored and drawn off gradually.

Additional culvert area would be the only remedy for the above described conditions. There is ample channel room for a second culvert so that the present culverts could remain in place. The areas required are shown on Plate II. Talking here about Point Grove Road - not about Rte 1 Ave.

(b) Outlet to Lakes. - The failure at North Pond, in the early morning of August 20, 1955 occurred after all of the surface run-off was in the lakes. The groundwater flow was still coming in strongly, however, so that the lakes were still rising, but the additional rise would have been insignificant. It is thus evident that very little additional freeboard on the plug in the north end would have saved the disaster.

North Pond to be restored and an outlet constructed to carry off the floodwaters safely in one of two manners. Each has certain advantages and disadvantages.

(1) Alternative No. 1 (Plate VI) Reconstruct a plug in the north outlet. Reconstruct the present outlet to Great Brook and raise the roadway at the outlet (Berkshire Ave.) to form a safe dam. Raise and strengthen the dike at the south end.

This would restore the lakes to their previous condition, except that the restraining dikes would be higher and stronger. The outlet structure would be more substantial and considerably larger than the present corrugated iron culvert but it would still restrict the outflow to a nominal amount. The lakes would thus continue to have their historic function as a flood storage reservoir.

The disadvantage of this scheme is in the length of time required for the lakes to draw down after a major rise. Plate V illustrates the condition for a storm similar to that of August 1955. For a major rise in the early fall, the lakes would very likely be higher than normal until the summer of the next year.

(2) Alternative No. 2 (Plate VII) Construct a spillway in the North outlet with an improved channel to Great Brook. This would require an enlarged culvert under Longyard Road. It would also require an enlarged culvert under Point Grove Road in order to draw the flow from Middle and South Ponds into North Pond. The new outlet to Great Brook and the strengthened dike at the south end would be constructed the same as for Alternative No. 1.

The spillway at the north end would be set at normal lake level so that the ordinary flows would continue to go through Great Brook and only the overflow due to a rise in the Lakes would go out the north outlet.

The advantage of this scheme is in the speed with which the lakes drop to normal level after a rise. There would also be less rise in the lakes. Both of these would diminish the difficulties with flooded cellars and other similar nuisances around the shore of the lake. Plate V illustrates the pattern of rise and fall for a storm similar to that of August 1955. It will be noted that the spillway would decrease the maximum rise by 0.8 feet for such a storm.

The disadvantage of the scheme is in its cost. Also, it would add about 1,000 c.f.s. to the streams below approximately at the time of maximum flood.

4. CONCLUSIONS AND RECOMMENDATIONS. - Based on the study, the following conclusions and recommendations are made:

(a) Great Brook Channel. New culverts to alleviate property damage due to flooding of Great Brook Channel, as shown on Plate II, are estimated to cost about $119,000. The amount of property damage, as we have been informed of it, will not justify this expenditure. Nor would a materially lesser expenditure be of any material benefit. It is concluded, therefore, that no major program of improvement is warranted at this time.

The channel has not been investigated in detail to ascertain whether or not there are minor nuisances which could be abated by minor improvement.

(b) Lake Outlet. It is recommended that the Lakes be restored by construction of a plug in the north outlet; that the present outlet to Great Brook be improved and strengthened; and, that the dike at the south end be raised and strengthened; all substantially as outlined under Alternative No. 1 (Plate VI). It is estimated that this would cost about $51,500 as compared with $171,300 for an auxiliary spillway and its necessary appurtenances (Alternate No. 2, Plate VI).

Sufficient benefits are not apparent to warrant the extra costs for the more expensive scheme. Nor is it certain that added damages downstream would not offset any benefits the spillway scheme might offer the lake property.

(c) Lake Levels. At present the lakes are approximately at Elevation 225.3, U.S.G.S. Datum. The levels were reported to have been raised one to two feet during recent years when a bridge outlet to Great Brook was replaced by the present culvert outlet. There appears to be some dissatisfaction with the present levels among the adjacent property owners.

No reason is known for establishment of the lake level, except to the satisfaction of the property owners so that it is recommended that the local officials be allowed to decide the point. The question would be "whether the property owners prefer the lake levels as they now are, or whether they would like to have them lowered, say one foot, and thus have them approximately the same amount lower in case of flood.

Theoretically, the dike levels which have been shown on the drawings could be lowered if the lake levels are lowered. Such is not recommended, however, on account of the uncertainty of future changes.

5. DRAINAGE AREAS. - The following is a breakdown of the drainage area up to the N.Y., N.H. & H. Railroad Crossing of Great Brook just south of Southwick Station:

	Sq. Mi.	Acres
WATER SURFACE		
North Pond	.673	46.5
Middle Pond	.431	276.0
South Pond	.221	141.5
Total Water Surface (El.225)	.725	464
LAND SURFACE (Directly into Lakes)		
West Side of Lake	.862	552
East Side of Lake	2.618	1,675
Total Land Surface	3.480	2,227
TOTAL DRAINAGE AREA INTO LAKES	4.205	2,691
DOWNSTREAM FROM LAKE OUTLET		
Great Brook Proper	1.850	1,184
Johnson, Tuttle & Pearl Brooks	5.630	3,603
Brook thru Southwick Center	.786	504
TOTAL DOWNSTREAM FROM LAKE OUTLET	8.266	5,291
TOTAL DRAINAGE AREA UP TO R.R.CROSSING	12.471	7,982

The reservoir area at Elevation 230 is scaled from the U.S.G.S. Map as 640 acres. The Reservoir Volume Curve, Plate IV, was thus developed, assuming straight line areal variation between lake surface level and Elev. 230.

6. RAINFALL

(a) August 1955 Storm. - The site is very close to the point of maximum rainfall for the storm of August 18-19, 1955. Plate I shows cumulative rainfall graphs for nearby recording gages; Springfield, Mass., Norfolk, Conn., and Knightsville Dam, Mass. The following are the amounts recorded at nearby non-recording station, readings being taken in all cases at 8 A.M. on the day noted:

	18	19	Total
Westfield Sanatorium, Mass.	1.25"	18.15"	19.40"
Granville, Mass. (5 mi. northwest)	1.57"	16.81"	18.38"
Blandford, Mass. (14 mi. northwest)	2.00"	15.60"	17.60"
Torrington, Conn. (12 mi. south)	3.77"	9.52"	13.29"

An isohyetal map of the storm, prepared by the U. S. Weather Bureau indicates that about 18.0" fell in the vicinity of Congamond Lakes.

(b) Design Storm. The August 1955 storm greatly exceeded all records for the region. Meteorological conditions, even for a hurricane storm, were exceptional. A design storm with a total fall of 18.0" has therefore been taken, with distribution paralleling that of Aug. 18-19, 1955. Plate I shows a graph of the assumed distribution.

Assumption of a greater rainfall is not considered warranted for basic design. Freeboard will be allowed on all dikes and other similar structures, however, in order to give a reasonable factor of safety over and above the basic design.

7. STORM RUN-OFF

(a) Inflow to Lakes. Inflow to the lakes may be considered to consist of groundwater inflow, direct fall on the lakes, surface run-off, and, for the August 1955 storm, inflow at the Great Brook outlet and over the south end dike.

The Congamond Lakes have only one small brook as a feeder. It thus appears that they are largely fed by subsurface springs. Under this condition, an exceptionally large percentage of a rainfall would reach the lakes as groundwater inflow and, due to the narrowness of the drainage basin, a large percentage of the groundwater would be released rapidly. This condition is confirmed by records for the August 1955 storm.

On account of the large proportion of water surface, the direct rainfall on the lakes is a significant factor. The equivalent rate of inflow is a direct function of the rate of fall and reaches the lakes, of course, without any lag in time.

Surface run-off from the design storm has been estimated by theoretical formulae, balancing the results as nearly as possible with the Aug. 1955 storm. For this, the only significant records are:

Maximum Elevation of Lakes 229.3
Time of failure (presumably at max. elev.) 1 A.M., Aug. 20, 1955.

During the Aug. 1955 storm, flow of Great Brook is reported to have been reversed for a time. Water in the channel reached a height about one foot greater than the highway at the outlet (Berkshire Ave.) and flowed over the highway into the lakes. This is confirmed by the elevation of a flood mark taken near Point Grove Road (see Plate II). The condition, however, could have occurred only at the peak of the flood, and could not have been of long duration.

A similar occurrence is reported at the south end dike. Here there is no record of the exact height or duration of the inflow. The lakes finally reached a height greater than the dike and there is evidence of outflow so that the duration of inflow must not have been great.

Neither of these latter two inflows was a major factor in the rise in the lakes.

A hydrograph of the design storm, following the above considerations, is shown on Plate III. The more or less arbitrary assumption was made that

groundwater inflow would be 220 c.f.s., or at the rate of 0.09"/hr., at the time the surface run-off is complete. At that time the total retention would be 8.6 inches, or 0.33" per hour of significant rainfall during the storm. The ground water is assumed to taper off in rate to 10 c.f.s. one week later. At that time the total retention would be 4.7 inches, or 0.15" per hour of significant rainfall.

From the above, assuming the Aug. 1955 storm to be similar, the following balance of inflow and outflow volume is made, up to the time of failure of North Pond.

TOTAL INFLOW - BY RAINFALL

Direct fall on Lake	7,870	hr. sec. ft.
Surface Run-off (7.60")	17,070	" " "
Groundwater Inflow (1.80")	4,060	" " "
Overflow from Great Brook	3,300	" " "
Overflow from South Dike	900	" " "
Total	33,200	hr. sec. ft.

TOTAL INFLOW - BY RISE IN LAKES & OUTFLOW

Storage in Lakes	28,000	hr. sec. ft.
Outflow, Great Brook before reversal	1,450	" " "
Outflow, Great Brook after reversal	1,550	" " "
Outflow, over South Dike	1,200	" " "
Outflow, Out North Channel	1,000	" " "
Total	33,200	hr. sec. ft.

The above amount of surface run-off gives an infiltration index of 0.50"/hr. which is not unreasonable. The distribution of this run-off was based on unit hydrograph of the several distinct areas.

(b) Inflow to Great Brook. Inflow to Great Brook up to the railroad crossing near Southwick Station can be broken down into the following components:

Outflow from the Lakes
Inflow from Johnson Brook (incl. Tuttle & Pearl Brooks)
Inflow from brook through Southwick Center
Inflow from remaining drainage area (Great Brook Proper)

It is desirable to remedy the condition allowing reversal of the flow of Great Brook into the lakes (except for what might back through the outlet culvert). On the other hand, it can be assumed that the lakes would be contributing a negligible amount to Great Brook flow during the peak of a major storm.

There are no available data from which the inflow into Great Brook during the Aug. 1955 storm can be computed with accuracy. The U. S. Geological Survey gives a peak flow of 3,610 c.f.s. from 19.3 sq. mi., the point of measurement evidently being downstream from the area under consideration. Just how this peak was affected by storage above the obstructions, or by failure of the obstructions, cannot now be evaluated.

Theoretical inflows were computed from unit hydrographs based on Snyder's formulae. From these, the following values are obtained, depending on differing assumptions as to infiltration rates. (Flows from the smaller areas are at the time of peak of the larger area).

	Infiltration Rate		
	0.15"/hr.	0.20"/hr.	0.30"/hr.
Johnson Brook	4,000 cfs	3,850 cfs	3,500
Great Brook Proper	1,280 "	1,200 "	1,100
Brook through Southwick Center	600 "	550 "	520
Total	5,980 cfs	5,600 cfs	5,120 cfs

The Kinnison-Colby "rare" flood would have a computed peak of 2,380 cfs.

From the above, an outflow of 4,000 cfs is considered safe and reasonable for design of a culvert at the railroad crossing, taking into account the reduction in peak due to storage in Great Brook Channel.

8. RISE IN LAKE LEVELS. - A 50 foot length of spillway at the north end is about the largest that can be constructed reasonably. An 8-foot long spillway at the Great Brook outlet is about the optimum that will serve the dual purpose of limiting outflow during storm peaks and lowering the lakes to normal within an allowable time after a major rise. The design storm (Plate III) was therefore routed over these spillways with results as shown on Plate V. This plate shows the cumulative volume of inflow from the design storm and the cumulative outflow for the two spillway designs, with corresponding Lake elevations. It will be noted that the lakes would rise to Elev. 229.1, or about 0.2 ft. below the level of Aug. 19, 1955, for the outlet at Great Brook only. With the spillway the the north end, the lakes would rise to Elev. 228.3, a decrease of 0.8 ft. over the other design.

The Great Brook outlet would discharge about 210 c.f.s. at maximum level of the lakes but only about 120 c.f.s. at the peak of the storm. The 50-foot spillway would discharge about 1,050 c.f.s. at maximum level of the lakes.

9. COSTS

(a). Great Brook Channel. Detail cost estimates for culverts at the railroad crossing and at Point Grove Road as shown on Plate II are

summarized in the following:

Railroad Culvert	$86,400
Point Grove Road Culvert	32,600
Total	$119,000

(b) Lake Outlet, Alternative No. 1 - Table A shows detail cost estimates for the dikes and protective works proposed under Alternative No. 1 (Plate VI). A summary is:

Dike at North End	$ 24,900
Great Brook Outlet	21,600
Dike at South End	5,000
Total	$ 51,500

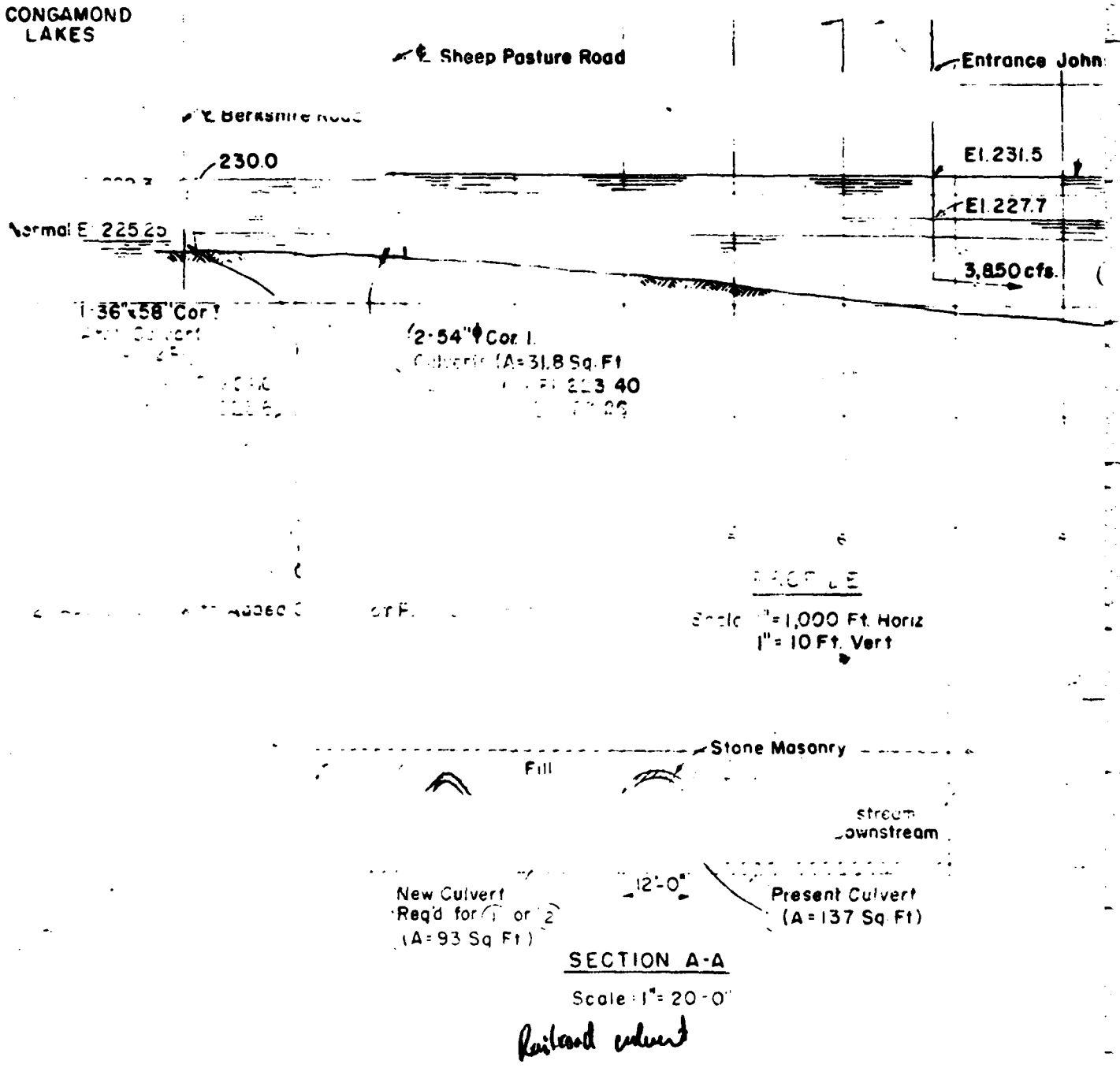
(c) Lake Outlet, Alternative No. 2. Detail cost estimates for the various component parts required by the north end spillway scheme, Alternative No. 2, Plate VII, are summarized below:

Great Brook Outlet	$21,600
Dike at South End	5,000
Spillway Dam at North End	67,200
Spillway Channel at North End	24,700
Culvert, Longyard Road	16,000
Culvert, Middle to North Pond	36,800
Total	$171,300

TABLE A

COMMANCHE LAKES
ALTERNATIVE NO. 1
ESTIMATE OF COST

ITEM	Description	Quantity	Unit	Unit Price	Amount
I.	**DIKE AT NORTH END**				
1.	Temporary Closure at Point Grove Rd.	L.S.	-	-	$ 1,500
2.	Diversion North Pond Inflow	L.S.	-	-	800
3.	Excavation	400	cu.yds.	1.50	600
4.	Compacted Fill	5,670	" "	2.75	15,600
5.	Gravel Filter	50	" "	6.00	300
6.	Riprap	100	" "	9.00	900
					$19,700
	Engineering & Administration	10	%		1,970
					$21,670
	Contingencies & Unforeseen	15	%		3,230
	Total				$24,900
II.	**GREAT BROOK OUTLET**				
1.	Care and handling of Water	L.S.	-	-	$ 500
2.	Excavation	670	cu.yds.	1.25	840
3.	Backfill & Roadway Fill	2,450	" "	2.25	5,500
4.	Concrete	48	" "	35.00	1,680
5.	Forms	2,200	sq.ft.	1.25	2,750
6.	Reinforcing Steel	5,300	lbs.	0.13	690
7.	Roadway Surfacing	1,200	sq.yds.	3.00	3,600
8.	Shoulder and Misc. Work	L.S.	-	-	1,500
					$17,060
	Engineering & Administration	10	%		1,700
					$18,760
	Contingencies & Unforeseen	15	%		2,840
					$21,600
III.	**DIKE AT SOUTH END**				
1.	Access	L.S.	-	-	$ 1,000
2.	Fill	1,200	cu.yds.	2.50	3,000
					$4,000
	Engineering & Administration	10	%		400
					$4,400
	Contingencies & Unforeseen				600
					$5,000



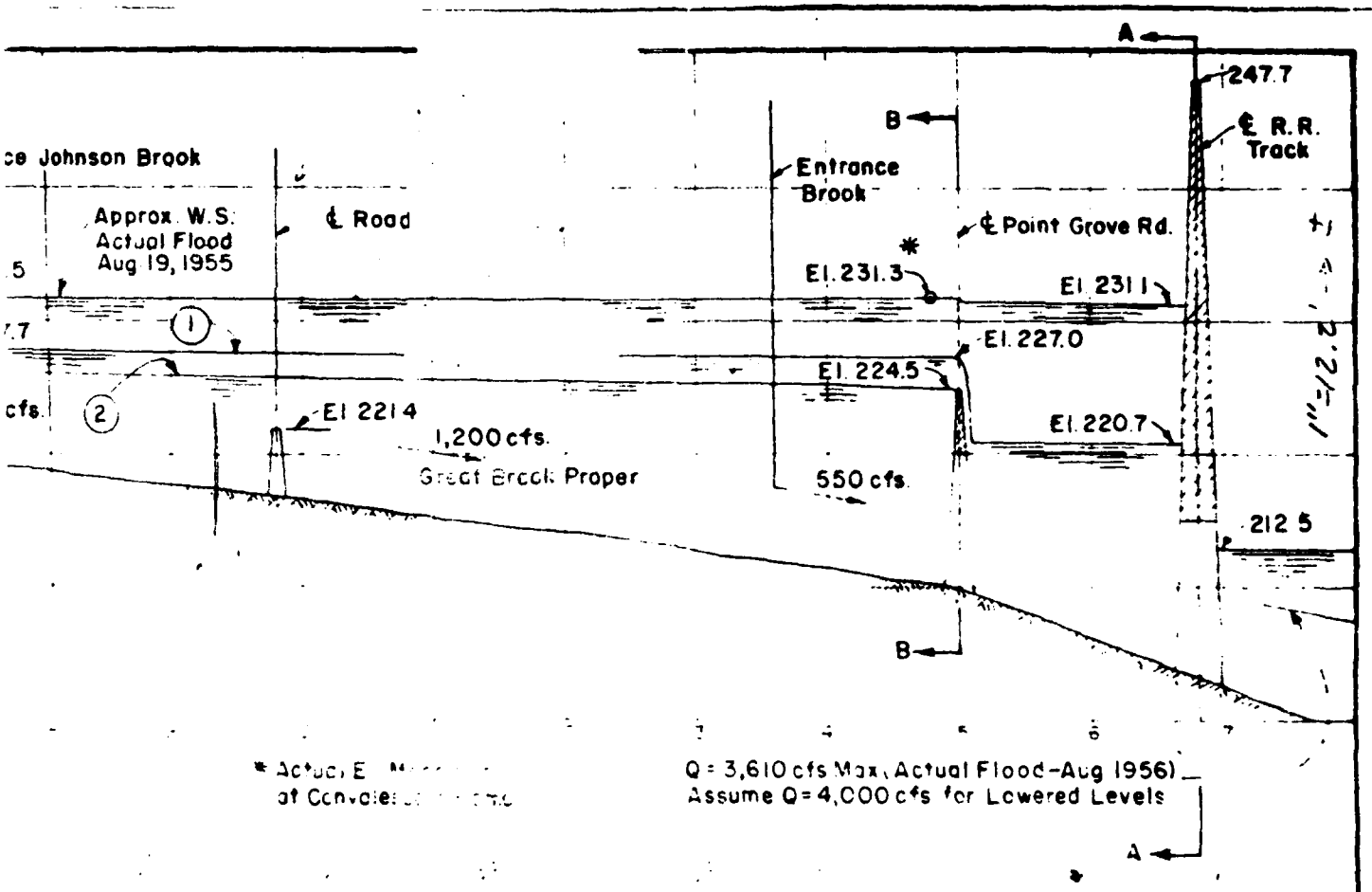
PROFILE

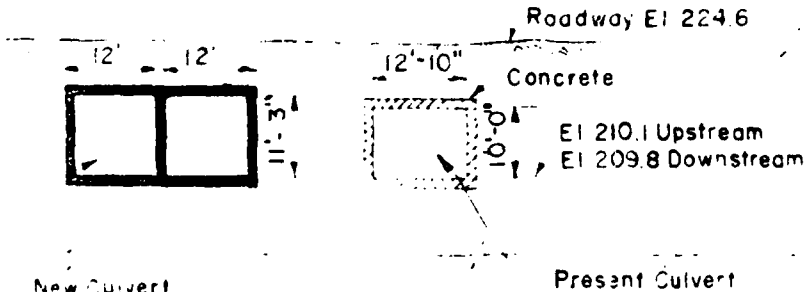
Scale 1"=1,000 Ft. Horiz
1"= 10 Ft. Vert

SECTION A-A

Scale: 1"= 20'-0"

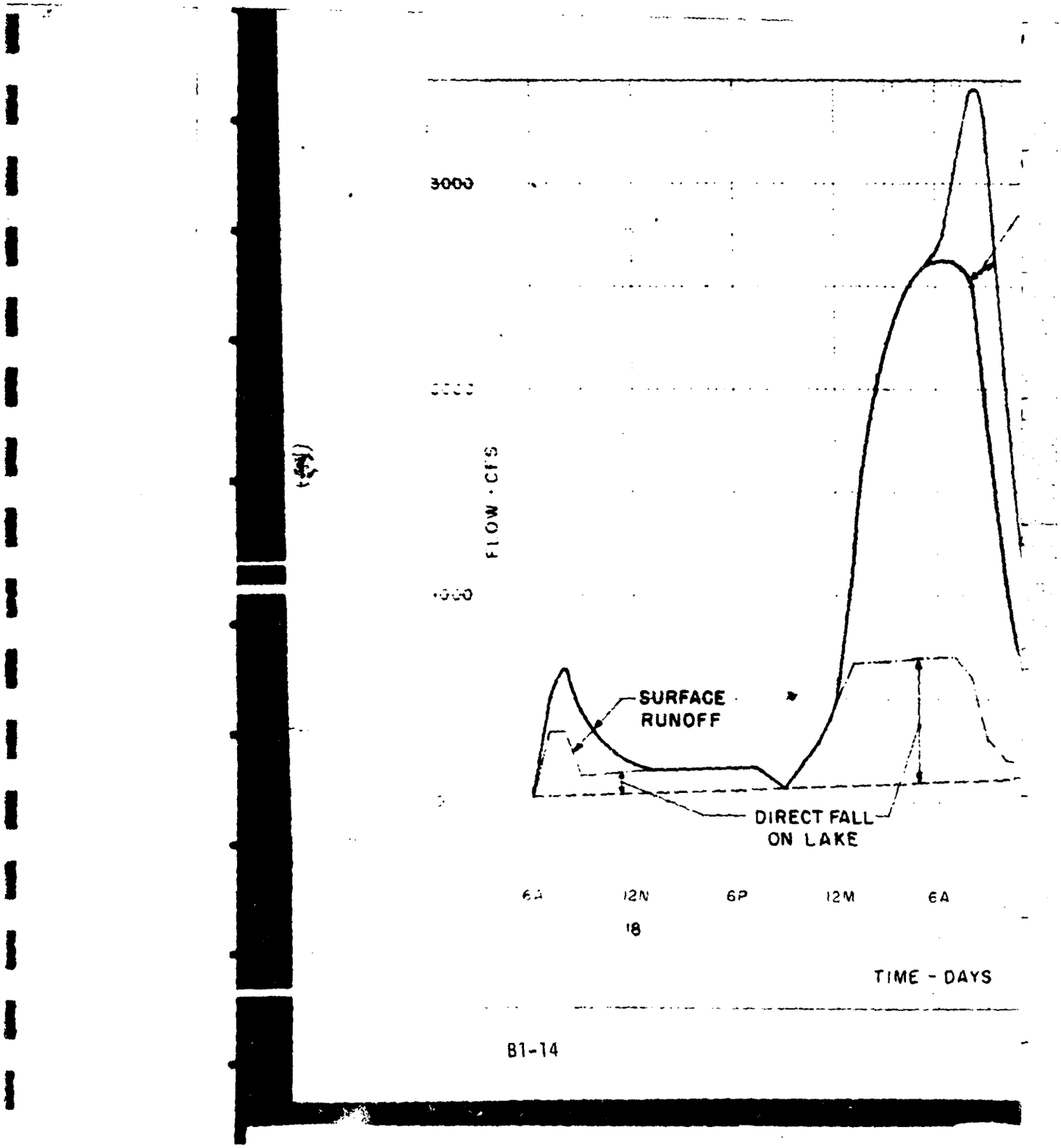
Railroad culvert

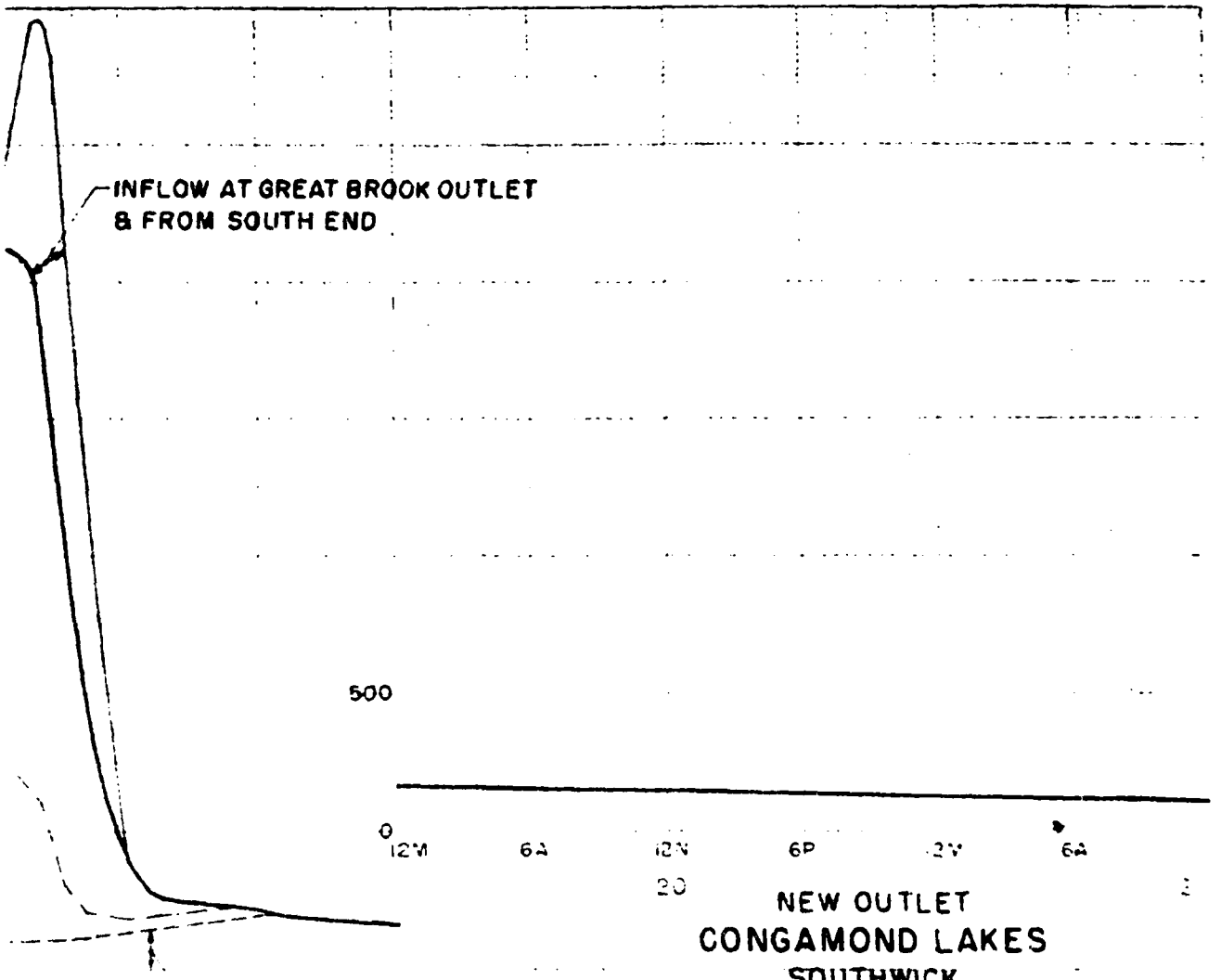




NEW OUTLET
CONGAMOND LAKES
SOUTHWICK
PROFILE OF GREAT BROOK
DEPT OF PUBLIC WORKS OF MASS.
DIVISION OF WATERWAYS
MAY 1956
SCALE: AS SHOWN
CHAS. T MAIN, INC.
BOSTON, MASS. CHARLOTTE, N.C

PLATE II


3000
FLOW - CFS
SURFACE
RUNOFF
DIRECT FALL
ON LAKE
6A
12N
6P
12M
6A
18
TIME - DAYS



NEW OUTLET

CONGAMOND LAKES

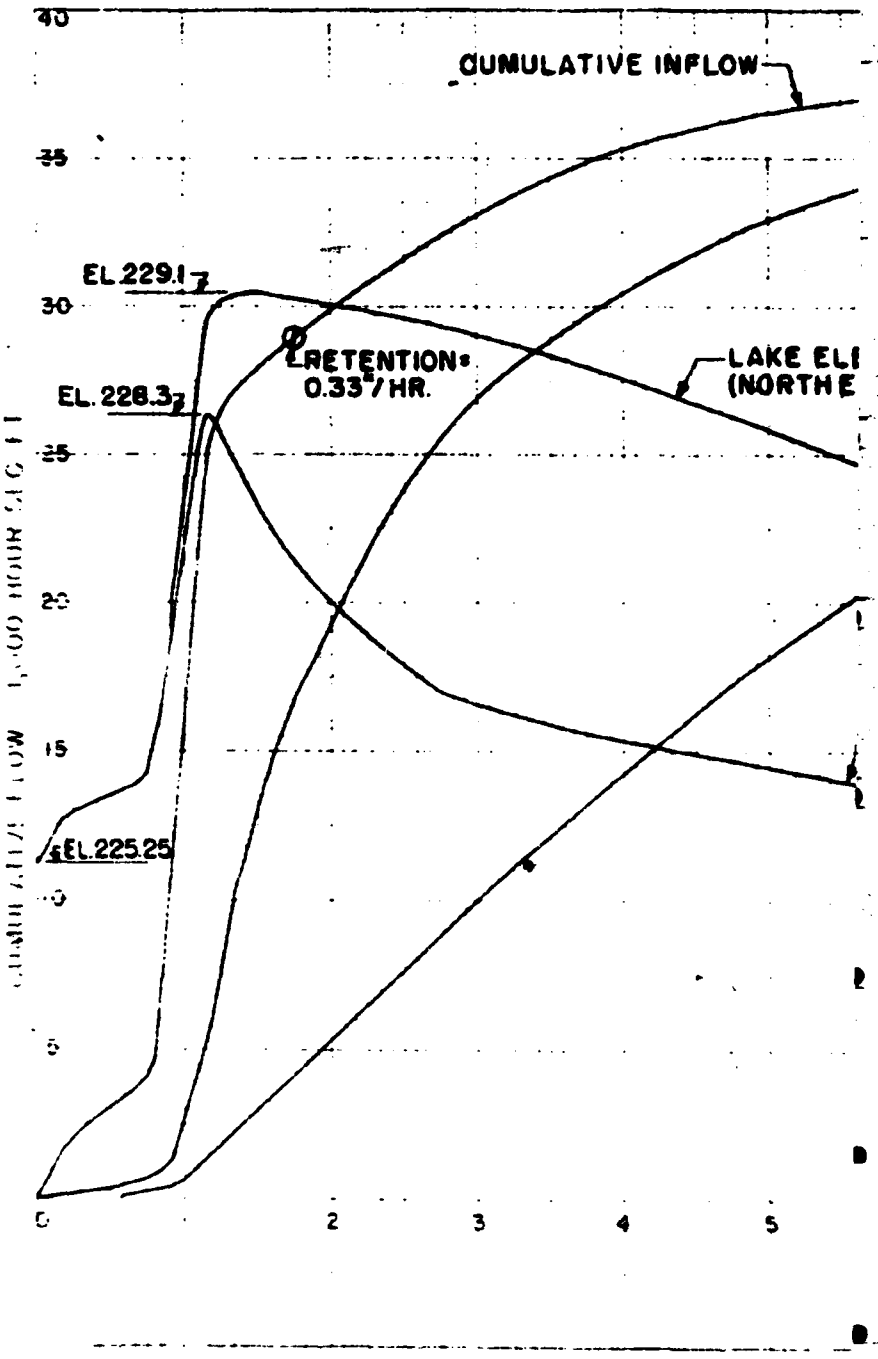
SOUTHWICK

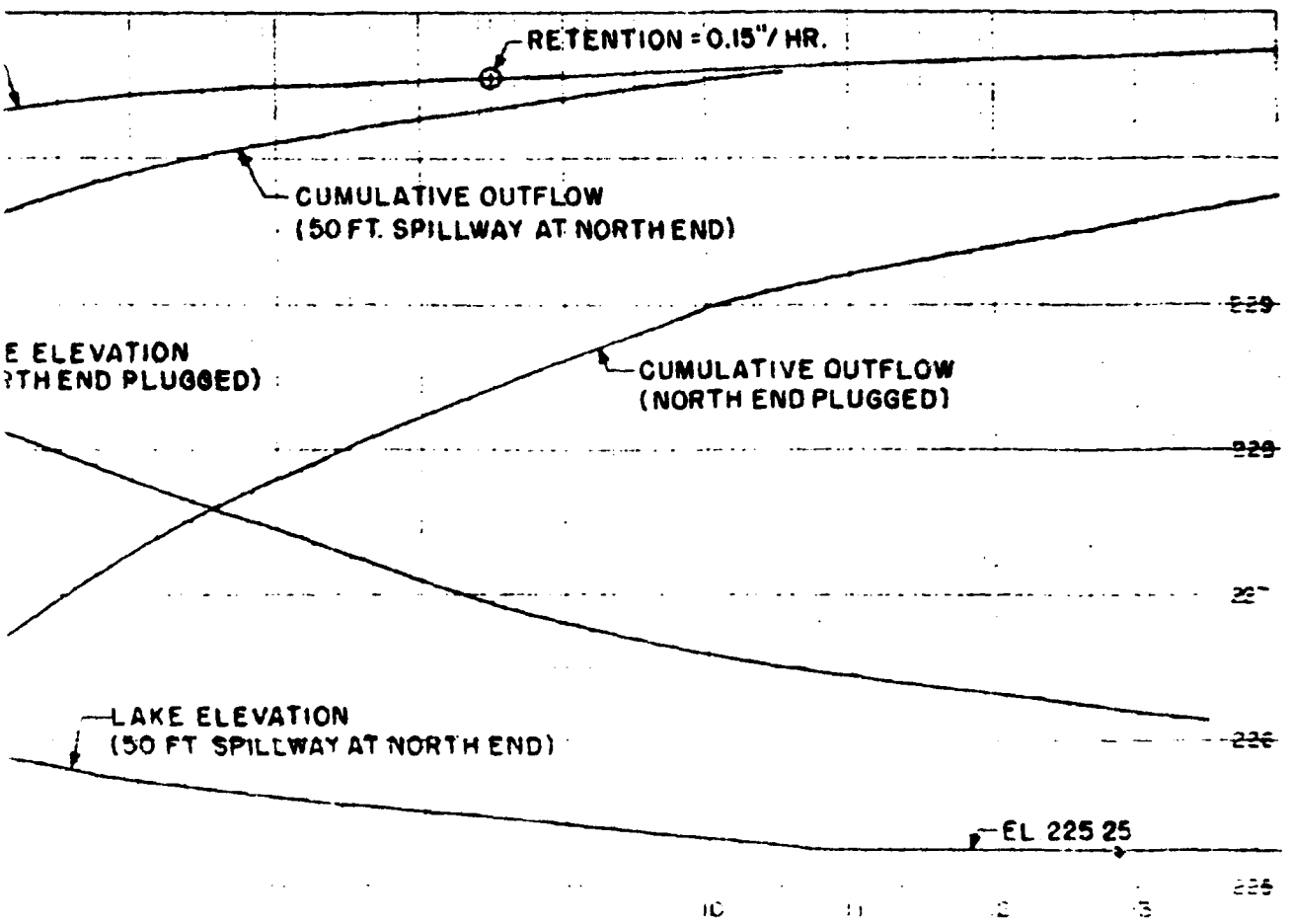
HYDROGRAPH OF INFLOW TO LAKES FROM DESIGN STORM

DEPT. OF PUBLIC WORKS OF MASS.
DIVISION OF WATERWAYS
MAY 1956
SCALE: AS SHOWN

CHAS. T. MAIN, INC.
BOSTON, MASS. CHARLOTTE, N C

PLATE III


CUMULATIVE INFLOW
EL. 229.1
EL. 228.3
RETENTION
0.33"/HR.
LAKE ELI
(NORTHE
EL. 225.25
40
35
30
25
20
15
0
2
3
4
5



NEW OUTLET

CONGAMOND LAKES

SOUTHWICK

INFLOW, OUTFLOW, LAKE ELEVATIONS FOR DESIGN STORM

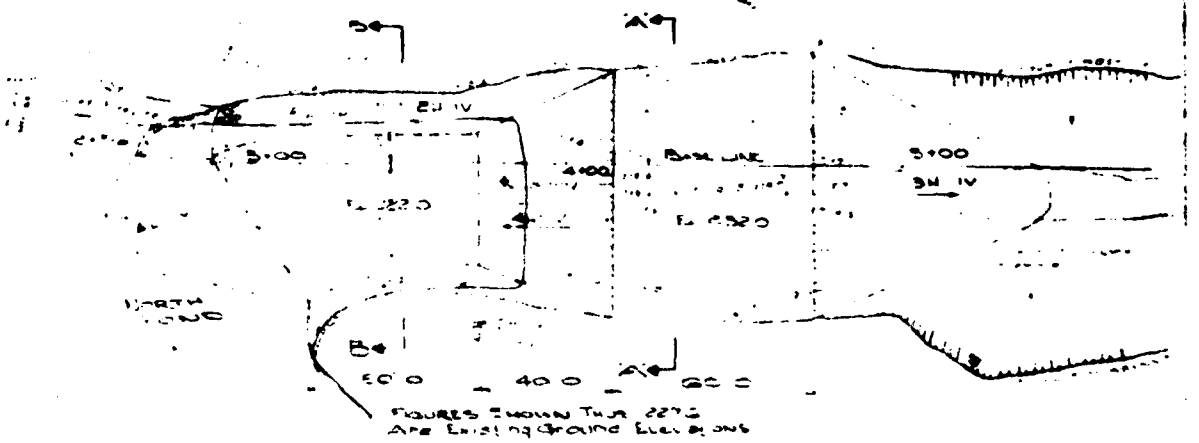
DEPT. OF PUBLIC WORKS OF MASS
DIVISION OF WATERWAYS
MAY 1956
SCALE: AS SHOWN

CHAS. T. MAIN, INC.
BOSTON, MASS. CHARLOTTE, N C

PLATE V

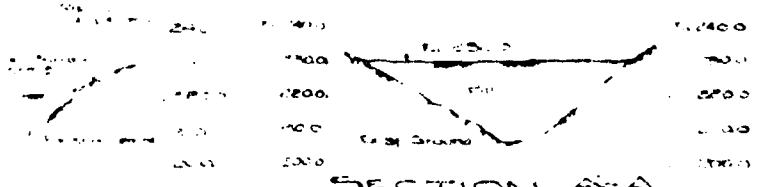
B1-16

LOCATION PLAN



FIGURES SHOWN THUS 227.5
ARE EXISTING GROUND ELEVATIONS

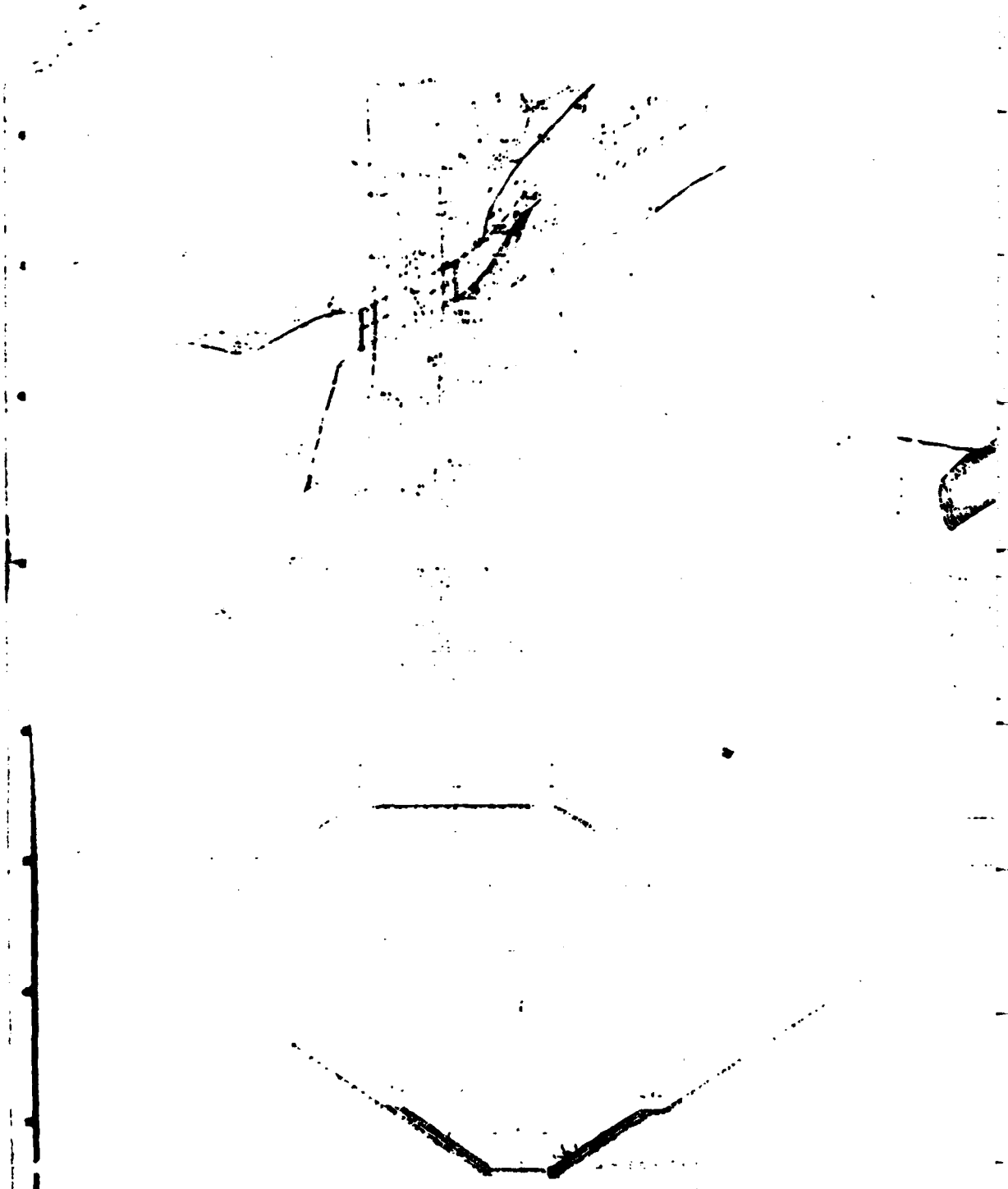
PLAN A



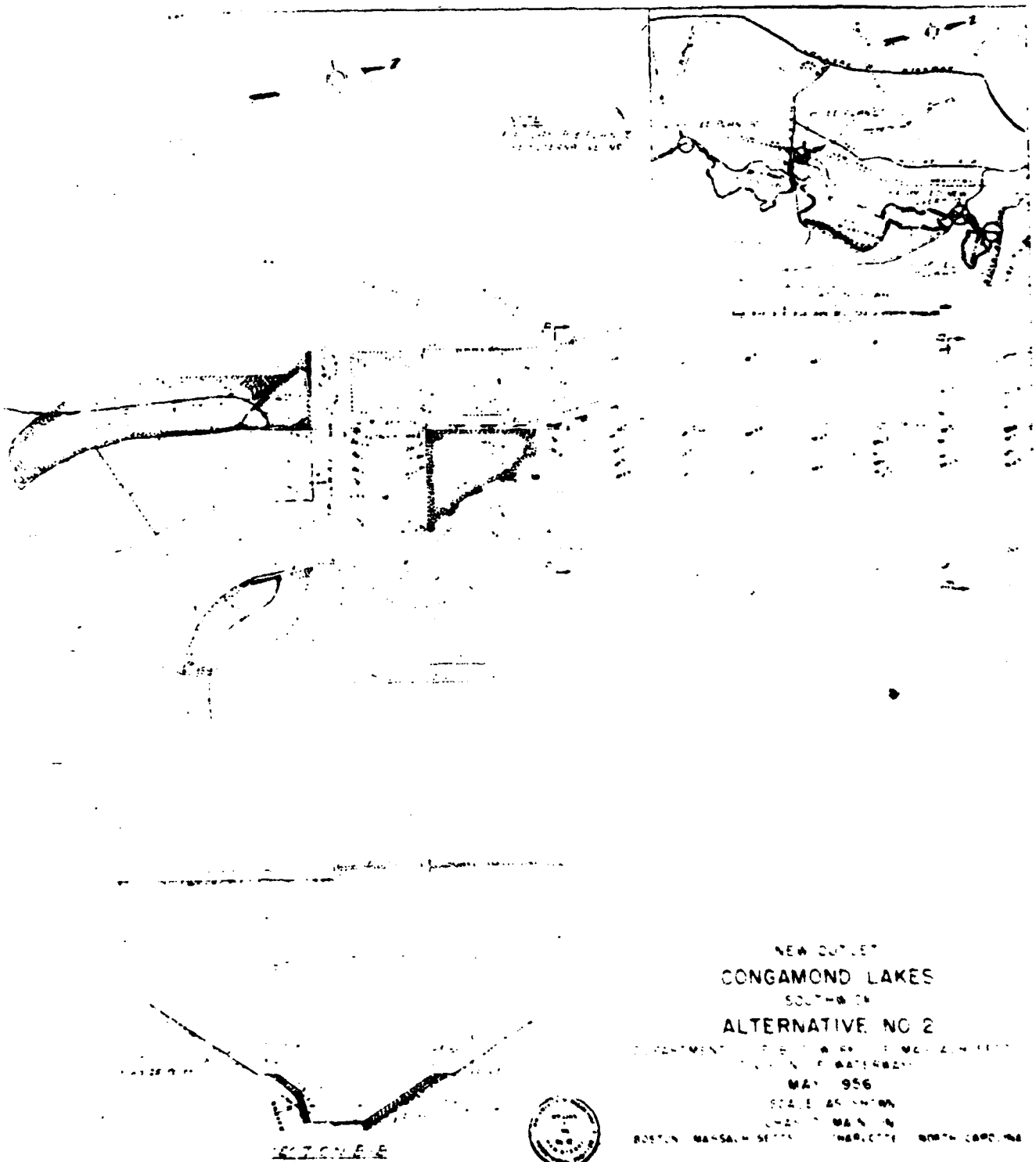
SECTION A-A

CONGAMOND LAKES

ALTERNATIVE NO.



SECTION C-B



NEW OUTLET

CONGAMOND LAKES

SOUTHBOROUGH

ALTERNATIVE NO 2

MAY 1956

SCALE AS SHOWN

BOSTON MASSACHUSETTS MARLBORO NORTH CAROLINA

SCALE

PREVIOUS INSPECTION REPORTS

Inspections of dams were performed by the Massachusetts Department of Public Works, District 2, and are on file at District 2 Headquarters, North King Street, Northampton, Massachusetts.

Earlier inspections were performed by the Hampden County Engineer and are filed in the office of the County Highway Engineer, Hampden County Hall of Records, 50 State Street, Springfield, MA.

Copies of Selected Previous Inspection Reports follow.

INSPECTION REPORT - DAMS AND RESERVOIRS

(1.) LOCATION:

City/Town Southwick. County Hampden. Dam No. 2-7-270-6

Name of Dam Congamond Lakes - North Dike

Topo Sheet No. 9D. Mass. Rect. Coordinates: N 384,000, E 258,800.

Inspected by: Harold T. Shumway, On May 6, 1977. Date Last Inspection 7-22-75

(2.) OWNER/S: As of May 6, 1977

per: Assessors____, Reg. of Deeds____, Prev. Insp. X, Per. Contact X.

	Name	St. & No.	City/Town	State	Tel. No.
1.	Board of Selectmen	Town of Southwick, Town Offices	Southwick, Mass.		
2.					
3.					

(3.) CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.
Same as above				

(4.) DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where None located.

(5.) DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor____.
2. Moderate X.
3. Severe____.
4. Disastrous____.

Comments: Approx. 78 million gallons impoundment in North Pond - would damage Longyard Road and adjacent property. Failure of North Dike could drain a major portion of entire Congamond Lakes complex which has a total normal capacity of 751 million gallongs plus. In the 1955 Flood local legend indicates that this volume of water was more than doubled.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: No outlets - see reports on Congamond Lakes - outlet Dam No. 2-7-279-5.

Controls_____, TYPE:_____

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____

No. 2 Location and Type:_____

Controls_____, Type:_____

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____

No. 3 Location and Type:_____

Controls_____, Type:_____

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____

Drawdown present Yes X, No_____. Operative Yes_____, No_____.
Comments: See inspection reports for Dam No. 2-7-279-5.

(7.) DAM UPSTREAM FACE: Slope 6:1 Variable, Depth Water at Dam 3' to 5'.

Material: Turf X. Brush & Trees_____. Rock fill_____. Masonry_____. Wood_____

Other Sandy bare topsoil.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs X. 4. Urgent Repairs_____.

Comments: Sandy soil, sparse turf cover, minor surface erosion noted. Wide expanse of top of embankment would appear to reduce hazard of above noted conditions.

(8.) DAM DOWNSTREAM FACE: Slope 1:1.

Material: Turf X. Brush & Trees X. Rock Fill_____. Masonry_____. Wood_____

Other Dump debris.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs X. 4. Urgent Repairs_____.

Comments: Heavy brush and small tree growth on lower portion of slope - considerable dump debris and trash scattered about on top and downstream slope.

(9.) EMERGENCY SPILLWAY: Available No. Needed No.

Height Above Normal Water_____Ft.

Width_____Ft. Height_____Ft. Material_____.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments: Water level controlled by controls on dam #2-7-279-5

(10.) WATER LEVEL AT TIME OF INSPECTION: 5+ Ft. Above_____. Below X.

Top Dam X F.L. Principal Spillway_____.

Other_____.

Normal Freeboard 5 Ft. 5'± to top of bank 1½' to 2' more rise to very top of embankment.

(11.) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Dense growth brush and small trees on downstream slope.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam Minor surface erosion from surface runoffs.

Cracked or Damaged Masonry N/A.

Evidence of Seepage None found - dense brush growth made close inspection difficult.

Evidence of Piping None found.

Leaks None found.

Erosion Yes, see damage to slopes line above.

Trash and/or Debris Impeding Flow N/A.

Clogged or Blocked Spillway N/A.

Other_____.

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed ____X____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

Conditions found at dike are approximately same as found on last inspection of 7-22-75. Dump debris is more noticeable along top of embankment - debris such as cut brush, leave piles, etc. It is very evident that the dike receives only minimal, if any, maintenance.

HTS/js

INSPECTION REPORT - DAMS AND RESERVOIRS

(1.) LOCATION:

~~City~~/Town SOUTHWICK. County HAMPDEN. Dam No. 2-7-279-6.

Name of Dam Congamond Lakes North Dike.

Topo Sheet No. 9D. Coordinates: Mass. Rect. N 384,000, E 258,800.

Inspected by: Harold T. Shumway, On 7/22/75. Date Last Inspection 9/14/73.

(2.) OWNER/S: As of July 22, 1975

per: Assessors_____, Reg. of Deeds_____, Prev. Insp. X, Per. Contact X.

Board of Selectmen

	Name	St. & No.	City/Town	State	Tel. No.
1.	Town of Southwick	Town Offices	Southwick, Mass.		
2.					
3.					

(3.) CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Same as owners

Name	St. & No.	City/Town	State	Tel. No.

(4.) DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where None located.

(5.) DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor_____.
2. Moderate X.
3. Severe_____.
4. Disastrous_____.

Comments: 78 million gallons capacity of pond-would damage Longyard Road and adjacent property. Failure of North Dike could drain a large portion of entire Congamond Lakes complex which has a total normal capacity of 751 million gallons plus. In the 1955 flood local legend indicates that this volume of water was more than double.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: No outlet-see reports on Congamond Lakes outlet - Dam No. 2-7-279-5.

Controls_____, TYPE:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____.

No. 2 Location and Type:_____.

Controls_____, Type:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____.

No. 3 Location and Type:_____.

Controls_____, Type:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____.

Drawdown present Yes X, No_____. Operative Yes X, No_____.
Comments: See Dam No. 2-7-279-5 Reports.

(7.) DAM UPSTREAM FACE: Slope 6:1 var., Depth Water at Dam 3' to 5'.

Material: Turf X. Brush & Trees_____. Rock fill_____. Masonry_____. Wood_____.

Other Sandy bare topsoil

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs X. 4. Urgent Repairs_____.

Comments: Sandy soil, sparse turf cover, some surface erosion evident but due to wide expanse of embankment this is no hazard to safety of dike at present time.

(8.) DAM DOWNSTREAM FACE: Slope 1:1.

Material: Turf X. Brush & Trees X, Rock Fill_____. Masonry_____. Wood_____.

Other Old Dump debris.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments: Heavy brush growth on slope-considerable debris from old dump made close inspection impossible.

(9.) EMERGENCY SPILLWAY: Available No. Needed No.

Height Above Normal Water_____Ft.

Width_____Ft. Height_____Ft. Material_____

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments: Water level controlled by controls on Dam #2-7-279-5

(10.) WATER LEVEL AT TIME OF INSPECTION: 5± Ft. Above_____. Below X.

Top Dam X F.L. Principal Spillway_____.

Other_____.

Normal Freeboard 5 Ft. 5'± to top of bank-1½' to 2' more rise to very top of embankment.

(11.) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Yes, dense growth of brush & brambles

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam Yes, some erosion from surface runoff-wide expanse of embankment makes erosion of minor hazard to dike.

Cracked or Damaged Masonry N/A

Evidence of Seepage None found

Evidence of Piping None found

Leaks None found

Erosion Yes, see item #7 and damage to slopes line above.

Trash and/or Debris Impeding Flow N/A

Clogged or Blocked Spillway N/A

Other_____.

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

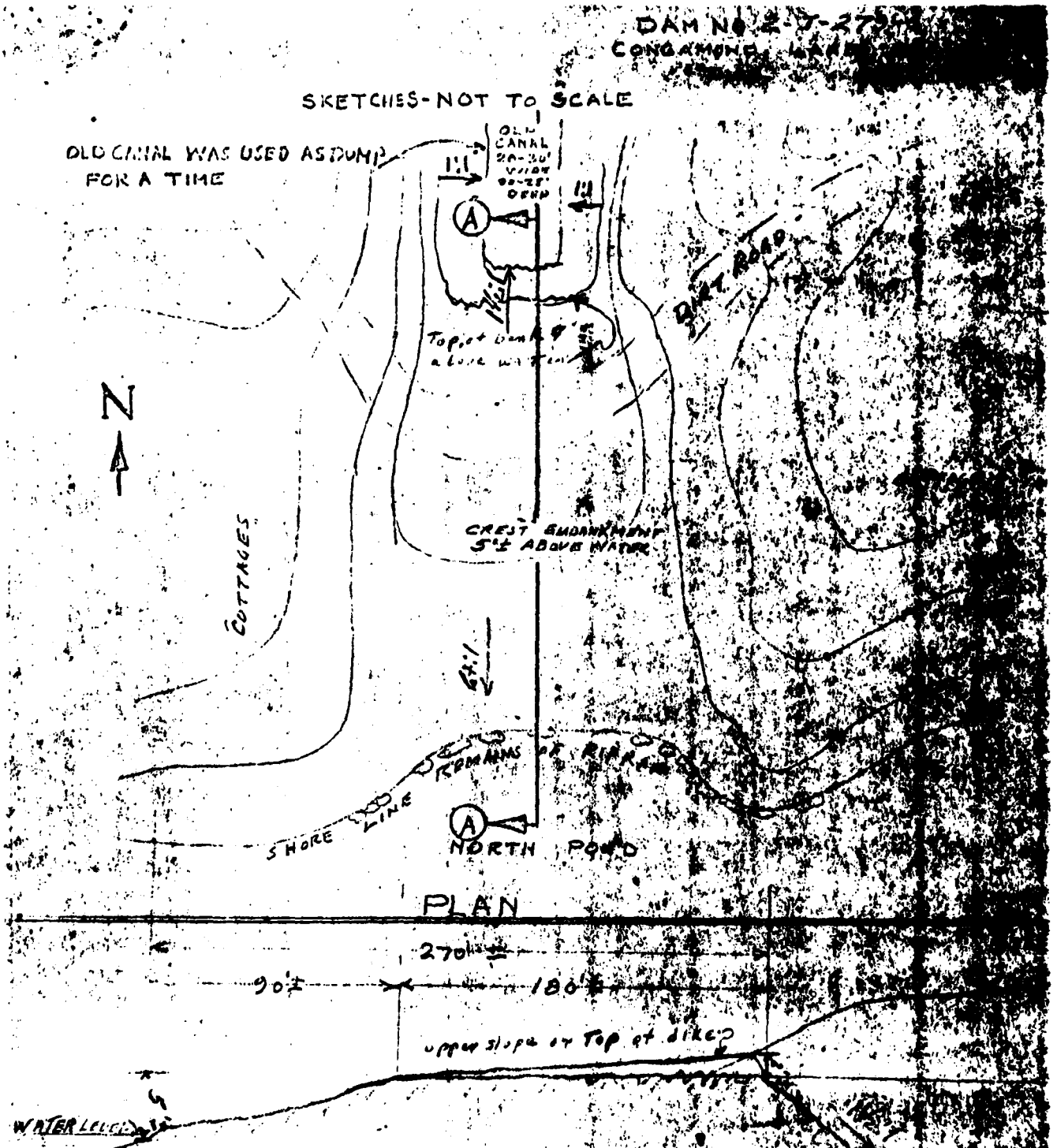
(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

Conditions at dike appear the same as found on last inspection of September 14, 1973. Sparse turf cover, sandy top soil, dense brush and bramble growth on downstream slope of dike, and considerable old dump debris are all still evident. Some erosion of upstream slope is evident but due to large expanse of dike, 270'± this poses little hazard to safety of dike at present time.
Mr. Francis Barnes, the Town of Southwick's Highway Supt. was present at this inspection and existing conditions were discussed with him. Mr. Barnes stated that no dumping is now allowed in area and that the old car bodies and discarded household appliances seen on slope and at toe of slope in old canal bed are the results of illegal dumping years back.
This dike appears to be stable and safe at present time but it was impossible to inspect toe of downstream slope due to brush and debris in the area.
Please note that the easting coordinate for dike has been changed from 258,200 to 258,800 to correct a previous error.

HTS:ma

DAM NO. 2-7-275
CONGAMOND LAKE

SKETCHES - NOT TO SCALE



Notations in red as of July 22, 1975 (H.T.S.)

X SECTION A.A.

B2-9

File Copy

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

~~City~~/Town Southwick. County Hampden. Dam No. 2-7-279-6.

Name of Dam Congamond Lakes North Dike.

Topo Sheet No. qn. Coordinates: Mass. Rect. N 384,000, E 258,200.

Inspected by: Russell C. Salla, P.E., On Sept. 14, 1973. Date Last Inspection 1969.

2. OWNER/S: As of June, 1972

per: Assessors X, Reg. of Deeds ____, Prev. Insp. ____, Per. Contact ____.

	Name	St. & No.	City/Town	State	Tel. No.
1.	Board of Selectmen, Town of Southwick	Town Hall	Southwick, Massachusetts		
2.					
3.					

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.

4. DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where None.

5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor ____.
2. Moderate X.
3. Severe ____.
4. Disastrous ____.

Comments: Could damage Longyard Road and Route 57 and adjacent property.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: No outlet - See Congamond Lakes Outlet, Dam Number 2-7-279-5.

Controls_____, TYPE:_____.

Automatic____. Manual____. Operative Yes____, No____.

Comments:_____.

No. 2 Location and Type:_____.

Controls_____, Type:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____.

No. 3 Location and Type:_____.

Controls_____, Type:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____.

Drawdown present Yes_x_, No_____. Operative Yes_____, No_____.
Comments: See Dam Number 2-7-279-5.

(7.) DAM UPSTREAM FACE: Slope Irregular 6:1, Depth Water at Dam 3' to 5'.

Material: Turf_x_. Brush & Trees_____. Rock fill___. Masonry___.Wood___.

Other Turf poor - material sandy.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments:_____.

(8.) DAM DOWNSTREAM FACE: Slope 1:1.

Material: Turf_____. Brush & Trees____. Rock Fill_____. Masonry_____. Wood_____.

Other Slope covered with dumped rubbish - old cars, washing machines, etc.

Condition: 1. Good_____. 3. Major Repairs__X_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments:_____.

(9.) EMERGENCY SPILLWAY: Available No. Needed No.

Height Above Normal Water_____Ft.

Width_____Ft. Height_____Ft. Material_____.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____.

_____

(10.) WATER LEVEL AT TIME OF INSPECTION: 5 Ft. Above_____. Below X.

Top Dam X F.L. Principal Spillway_____.

Other_____.

Normal Freeboard 5 Ft.

(11.) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment No.

Animal Burrows and Washouts None seen.

Damage to Slopes or Top of Dam Slopes irregular - downstream slope covered with rubbish.

Cracked or Damaged Masonry No.

Evidence of Seepage None seen.

Evidence of Piping None seen.

Leaks None noted.

Erosion Surface of embankment has very poor cover of turf and there are several washouts.

Trash and/or Debris Impeding Flow N/A.

Clogged or Blocked Spillway N/A.

Other_____.

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed__X__.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

This earth fill or embankment is very wide, 270 feet plus or minus, and about 90 feet from the edge of North Pond is about five feet above the water level. It is composed of a sandy material and much of the surface has no sod cover. There is considerable surface erosion but due to the width of the embankment there does not appear to be a problem. This erosion is caused by runoff from the high ground on either side of the dike particularly along the dirt roadway which leads down to the dike from either side. Most of this erosion would be eliminated by the installation of paved gutters and toe drainage but since the safety of the structure is not affected by the erosion installing of drainage is not necessary at this time.

This dike blocks the Old Hampshire and Hampden Canal. The old canal bed north of the dike is five feet to ten feet below the level of the water in North Pond and leads down on to flood plains of Great Brook. The old canal between the dike and Longyard Road was used for a time as a town dump and the side slopes of the canal and the downstream slope of the dike are covered with rubbish so that it is impractical to examine the toe area of the dike. Some water could be seen in the old canal bed.

The dike appears to have been built of material from the high ground on either side and the northern portion by pushing material into the old canal. It appears that there could be considerable unsuitable material incorporated into the fill.

RCS/js/sd

DESCRIPTION OF DAM

DISTRICT XI .

Submitted by Russell C. Salls, P. E. Dam No. 2-7-279-6

Date September 14, 1973 State/Town Southwick

Name of Dam Congamond Lakes North Dike

1. Location: Topo Sheet No. 9D Mass. Rect. Coordinates N 384,000 E 258,200

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

At Junction of Old Hampshire-Hampden Canal with North Pond - 600 Ft., south of South Longyard Road about 2500 Ft. southeasterly from Power Mill Road or about 2500 Ft. over Gravel Road - First left off Point Grove Road easterly of railroad crossing.

2. Year built Unknown Year/s of subsequent repairs Unknown

3. Purpose of Dam: Water Supply _____ Recreational X
Flood Control _____ Irrigation _____ Other Former reservoir for Hampshire-Hampden Canal Dam across old canal.

4. Drainage Area: Around 10 sq. mi. _____ acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban 20% Rural, Farm 70%
Wood & Scrub Land 10% Slope: Steep 10% Med. 40% Slight 50%.

5. Normal Ponding Area: 48 Acres; Ave. Depth 5'±
Impoundment: North Pond Only. 78 Million gals.; 240 acre ft.
Silted in: Yes _____ No X Approx. Amount Storage Area _____

6. No. and type of dwellings located adjacent to pond or reservoir _____
i.e. summer homes etc. Numerous full time residences and summer cottages.

7. Dimensions of Dam: Length 100' ± Max. Height 20' ±
Freeboard 5'
Slopes: Upstream Face 6:1 ±
Downstream Face 1"1
Width across top 270' ±

D2-14

Dam No. 2-7-279-6

8.

Classification of Dam by Material:

Earth X Conc. Masonry _____ Stone Masonry _____

Timber _____ Rockfill _____ Other _____

8A.

Dam Type: Gravity X Straight X Curved, Arched _____ Other _____

Overflow _____ Non-overflow _____

9.

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes X No _____ Beyond Longyard Road

C. Character Downstream Valley: Narrow _____ Wide X Developed _____

Rural X Urban _____

10.

Risk to life and property in event of complete failure.

No. of people 2

No. of homes 2

No. of businesses 1

No. of industries None Type _____

No. of utilities 3 Type Electric, Telephone Distribution Lines, and Gas Transmission Line.

Railroads None

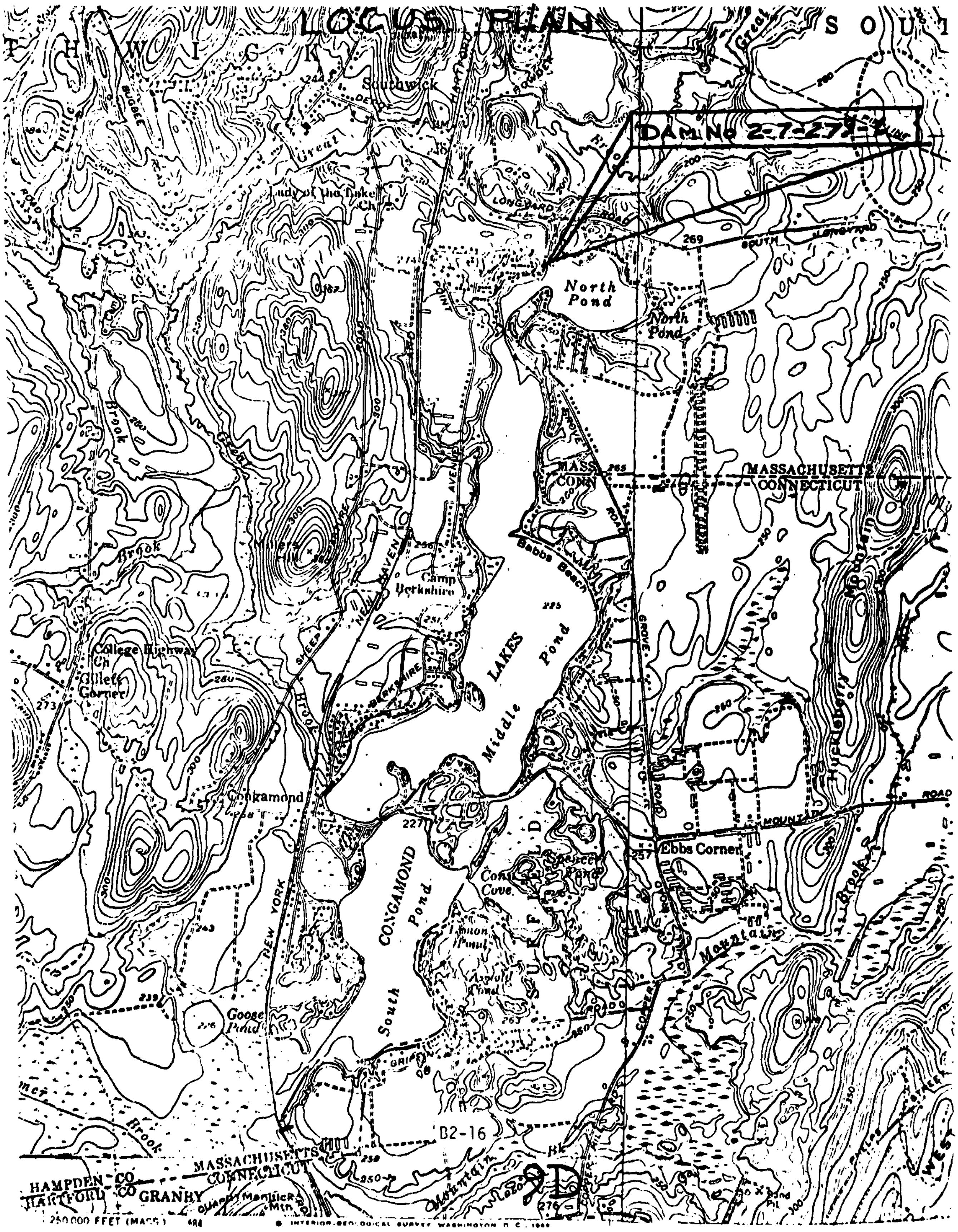
Other dams None on Great Brook

Other Highway culverts and bridges at Longyard Road and Route 57.

11.

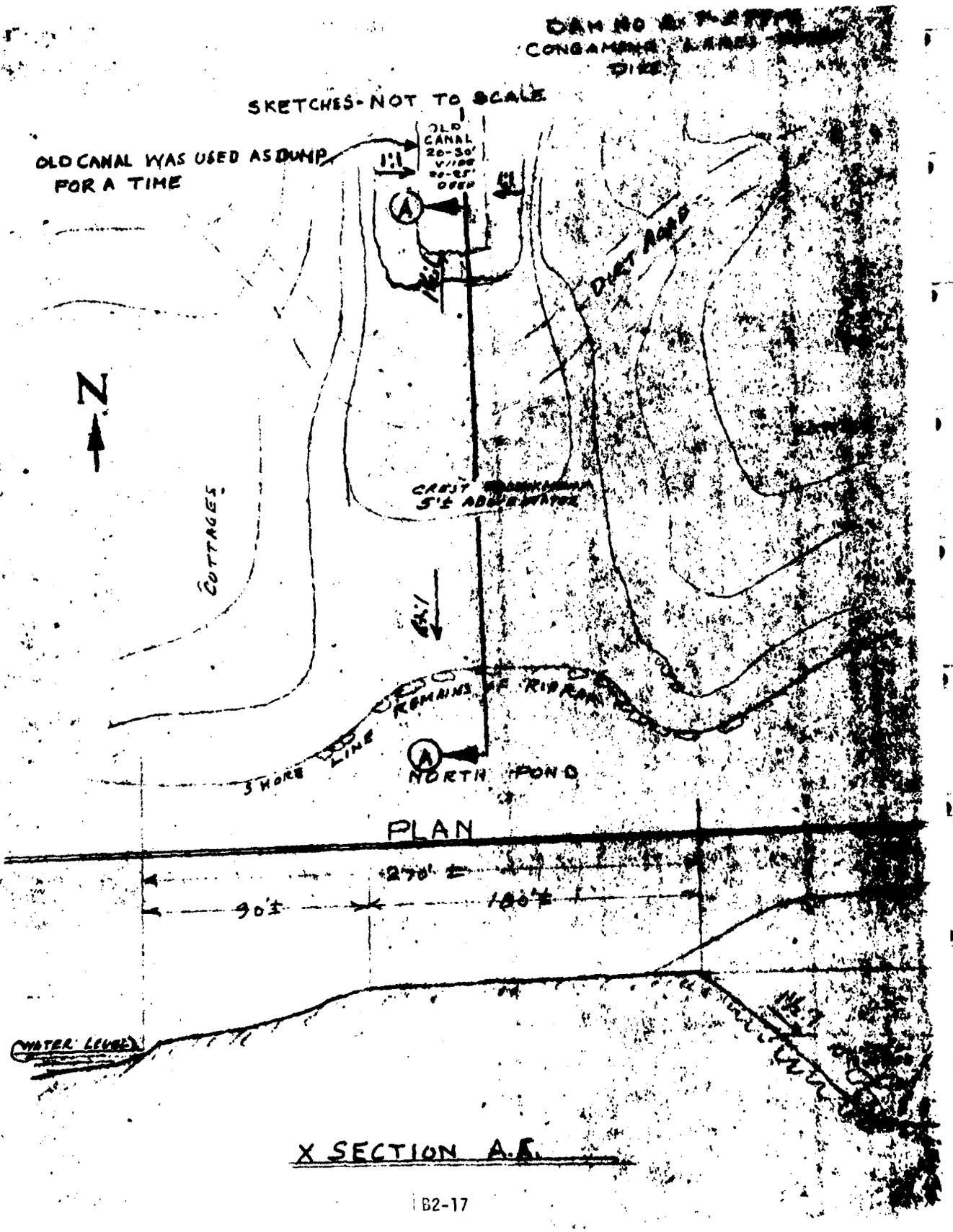
Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

RCS/vk/ed
Attachments
Locus Plan
Sketches


LOCUS PLAN
Southwick
North Pond
MASS
CONN
MASSACHUSETTS
CONNECTICUT
Babbs Beach
Camp Berkshire
LAKES
Middle Pond
College Highway
Gillett Corner
Congamond
CONGAMOND
South Pond
Ebbs Corner
Goose Pond
B2-16
HAMPDEN CO
HARTFORD CO
GRANBY
9D

DAM NO 8 PLATTE
CONGAMOND LAKES
DIKE

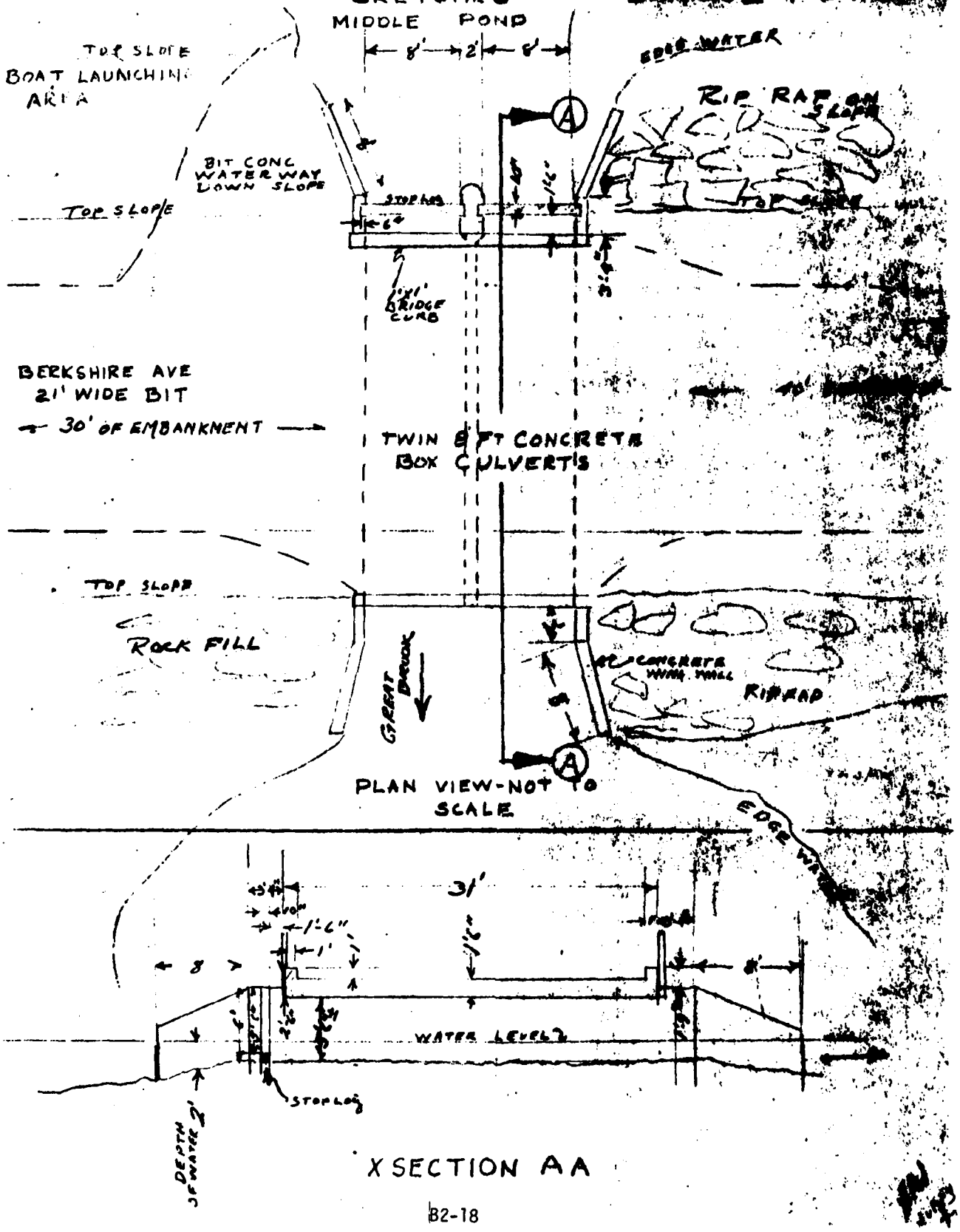
SKETCHES - NOT TO SCALE



PLAN

X SECTION A-A

SKETCHES


MIDDLE POND
8'
12'
8'
EDGE WATER
TOP SLOPE
BOAT LAUNCHING AREA
RIP RAP ON SLOPE
BIT CONC WATER WAY DOWN SLOPE
TOP SLOPE
STOP LOG
6"
1'x1' BRIDGE CURB
BERKSHIRE AVE
21' WIDE BIT
30' OF EMBANKMENT
TWIN 8 FT CONCRETE BOX CULVERTS
TOP SLOPE
ROCK FILL
GREAT BROOK
CONCRETE WING WALL
RIPRAP
A
A
PLAN VIEW-NOT TO SCALE
EDGE WATER
31'
1'-6"
1'
8'
WATER LEVEL
STOP LOG
DEPTH OF WATER 2'
X SECTION AA

FAY, SPOFFORD & THORNDIKE CONSULTING ENGINEERS

DAMS IN HAMPDEN COUNTY, MASSACHUSETTS

SOUTHWICK (279)

1. Irving Kimball Dam S-22-1 (SHEET 90)

   Mr. Irving Kimball, Kimball Container Co., Can-Pak Service, Inc. Feeding Hills, Mass.

2. Dr. Logie Dam S-22-2 (SHEET 90)

   Dr. Arthur J. Logie, Medical Arts Building, 30 Court St., Westfield, Mass.

3. Ahrens Dam S-22-3 (SHEET 90)

   Mr. D. N. Spencer, Vining Hill Road, Southwick, Mass.

4. Congamond Lakes South Dike S-22-4 (SHEET 90)

   Town of Southwick, Mass.

5. Congamond Lakes Outlet S-22-5 (SHEET 90) SAUNDERS

   Town of Southwick, Mass.

6. Congamond Lakes North Dike

   Town of Southwick, Mass.

7. Hathaway & Steane Co. Dam #1(on Slab Brook)

   Hathaway & Steane Corp., College Highway, Southwick, Mass.

8. Hathaway & Steane Co. Dam #2 (on Slab Brook)

   Hathaway & Steane Corp., College Highway, Southwick, Mass.

9. Hathaway & Steane Co. Farm Pond Dam (behind barn and farmhouse)

   Hathaway & Steane Co., College Highway, Southwick, Mass.

FAY & BOND CONSULTING ENGINEERS

10. Basil Tysz Dam

Mr. Basil Tysz, c/o Hathaway & Steane Corp., College Highway, Southwick, Mass.

11. General Cigar Corp. - Lower Dam

General Cigar Corp., 630 Oakwood Ave., West Hartford, Connecticut

12. General Cigar Corp. - Upper Dam

General Cigar Corp., 630 Oakwood Ave., West Hartford, Connecticut

The last routine inspections of all dams located within the Town of Southwick were conducted from time to time throughout the year 1969, and final inspections were made in the month of November. A letter-report on the conditions noted at each of the dams was sent to the Commissioners of Hampden County on November 20, 1969.

Many of the dams were in need of maintenance and repair work. These dams included the Dr. Logie Dam, the Ahrens Dam, now owned by Spencer, the outlet from Congamond Lakes, Dams #1, #2 and the Farm Pond Dam of the Hathaway & Steane Corporation, the dam of Basil Tysz and the two dams of the General Cigar Co.

Some inspections were made during the year 1970. The undersigned met with a representative of the General Cigar Corp. in June and outlined improvements to be made at each of the two dams, particularly the upper dam. These two dams should be inspected again before winter weather.

A copy of my report to the Commissioners of Hampden County is attached hereto for your information and file. Letters outlining the recommended maintenance and repair work at the various dams mentioned hereinbefore were sent to the owners of the dams by the Commissioners of Hampden County.

George H. McDonnell
County Hydraulic Engineer
Hampden County

C. Ahrens Dam (D. N. Spencer, present owner)

This dam and, in particular the abutment areas, are being allowed to deteriorate. On the day of inspection stoplogs were in the slots of the spillway opening to the full normal height and water in storage was at the level of the upper stoplog. The concrete and stone masonry dam itself is in fair condition. However, evidence on the ground indicates that at some time in the not too distant past, the dam has been overtopped by flood flows and a large quantity of water has washed out soil at the left end of the masonry portion of the dam from the natural sloping ground on the left bank of the stream immediately downstream of the dam. The right abutment area just downstream of the dam is still in the same general condition as reported previously. The stone wall on the right side of the stream valley is failing and the failure appears to be extending further along the wall.

The toe area in the stream bed is satisfactory.

Though the volume of water stored by this dam is quite small, and there is little chance that the sudden release of the water would damage persons and property downstream, it is recommended that conditions at the dam be called to the attention of the owner so that he may take corrective steps to prevent further deterioration of the dam and thus the possible loss of his investment. The dam does come under County jurisdiction because of its height. If it does continue to deteriorate, then a recommendation will eventually be made that the owner be directed to either repair or breach the dam.

D. Congamond Lakes South Dike

5-22-4

This dike was found to be in satisfactory condition. There is some weed growth on the side slopes but this growth is small and unimportant at present. There is also some small brush and very small tree growth on the pond side slope of the embankment. This growth is small and need not be cut as yet. The top of the dike embankment is in good condition.

In the opinion of the undersigned, conditions at this dike are satisfactory.

E. Congamond Lakes Outlet

The lake outlet itself was noted to be o.k. The concrete structure is in good condition and well maintained. One 8" x 12" stoplog is in each of the two bridge sections. The distance down to the top of the stoplogs in the slots on each side of the structure measures approximately 5 ft. 6 in. from the top of the masonry slots.

It was observed that water in the stream was being backed up by conditions downstream of the Congamond Lakes Outlet structure. An examination of the stream in the vicinity of the railroad bridge just below the outlet shows the presence of vegetation, debris and miscellaneous materials which hinder the flow of the water in the stream. The bed of the stream needs to be cleaned from a point 100 ft. more or less below the railroad bridge back to, thru and about one-half of the way upstream from the railroad bridge to the Lakes outlet structure. This condition does not endanger the outlet structure but prevents it from functioning as intended.

It might be advisable to notify the Selectmen of the Town of Southwick that the stream below the outlet is becoming plugged.

F. Congamond Lakes North Dike (6)

This compacted earth embankment was found to be in satisfactory condition. It is fairly massive and has a relatively high freeboard above lake level. There is very little sod cover on the surface and most of the original riprap has become displaced.

A portion of the surface is being eroded by surface wash. This erosion, though fairly deep and extensive at lower elevations on the embankment, does not endanger the structure in any way.

Some of the surface wash doing the damage may be originating from higher ground along the dirt road that leads down onto the dike from each side hill. Proper drainage facilities would eliminate the erosion. However, since the erosion is more of a nuisance nature and only detracts from any aesthetic value, it is not necessary, in the opinion of the undersigned, that a directive be given requiring that proper drainage be constructed to prevent extension of the erosion.

In the opinion of the undersigned, this dike is safe.

G. Hathaway & Steane Co. Dam #1 (7)

The embankment forming this dam is in fair condition. Brush growth should be kept cut down and a good sod cover should be developed and maintained on both road shoulders and on slopes that are not rock paved.

The spillway inlet structure is o.k. Normal stoplogs were in place but the pond elevation was noted to be quite low as a result of low brook flow and leakage at stoplog joints. Any poor or failing stoplogs should be replaced with new stoplogs of good quality.

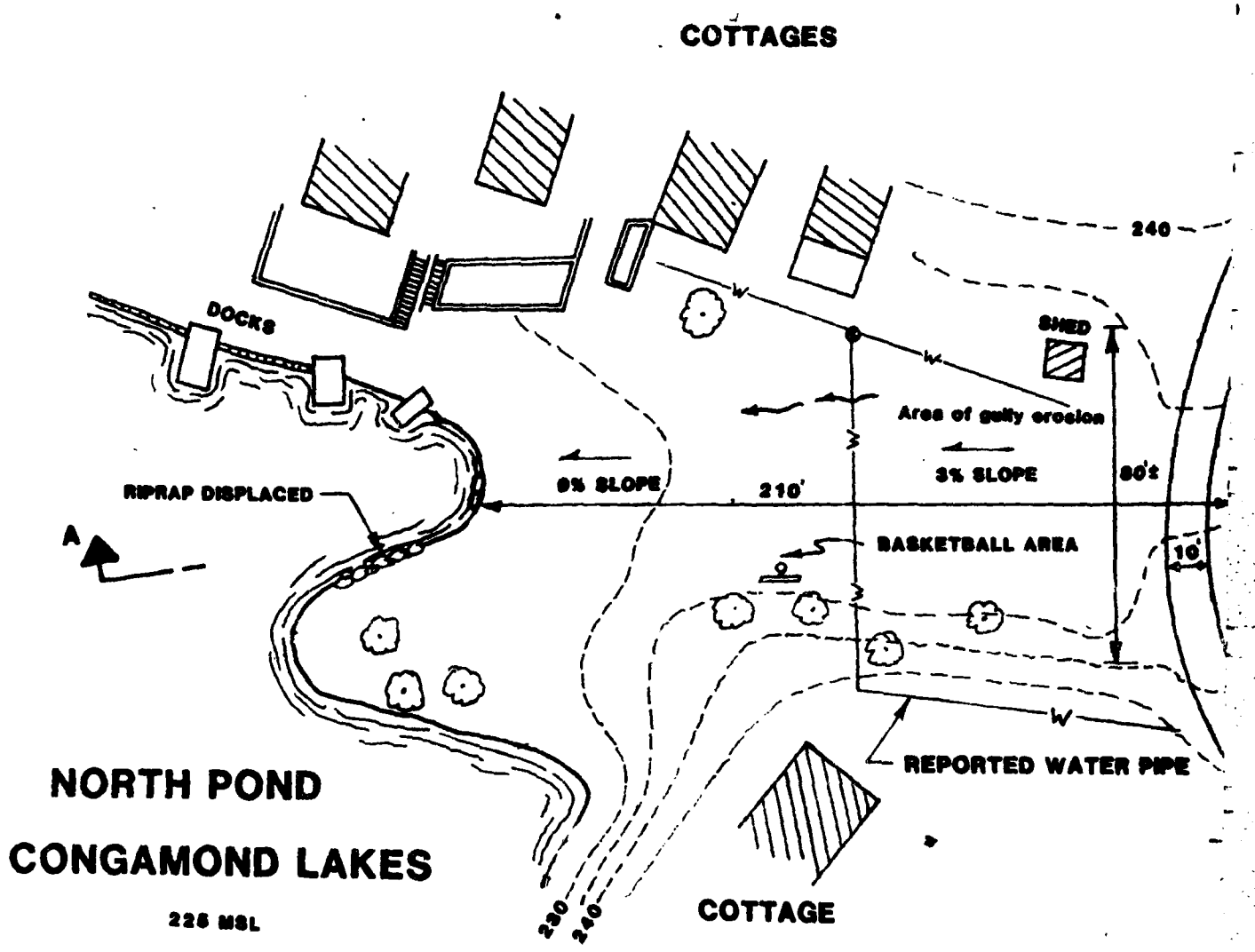
A. SKETCHES COMPILED DURING PHASE I INSPECTION SHOWING GENERAL LAYOUT OF DAM, TYPICAL SECTIONS AND DETAILS OF SIGNIFICANT FEATURES:

Figure 1. General Plan of Damsite

Figure 2. Typical Sections, including Berkshire Avenue Bridge and Point Grove Road Bridge

B. RECORD PLANS:

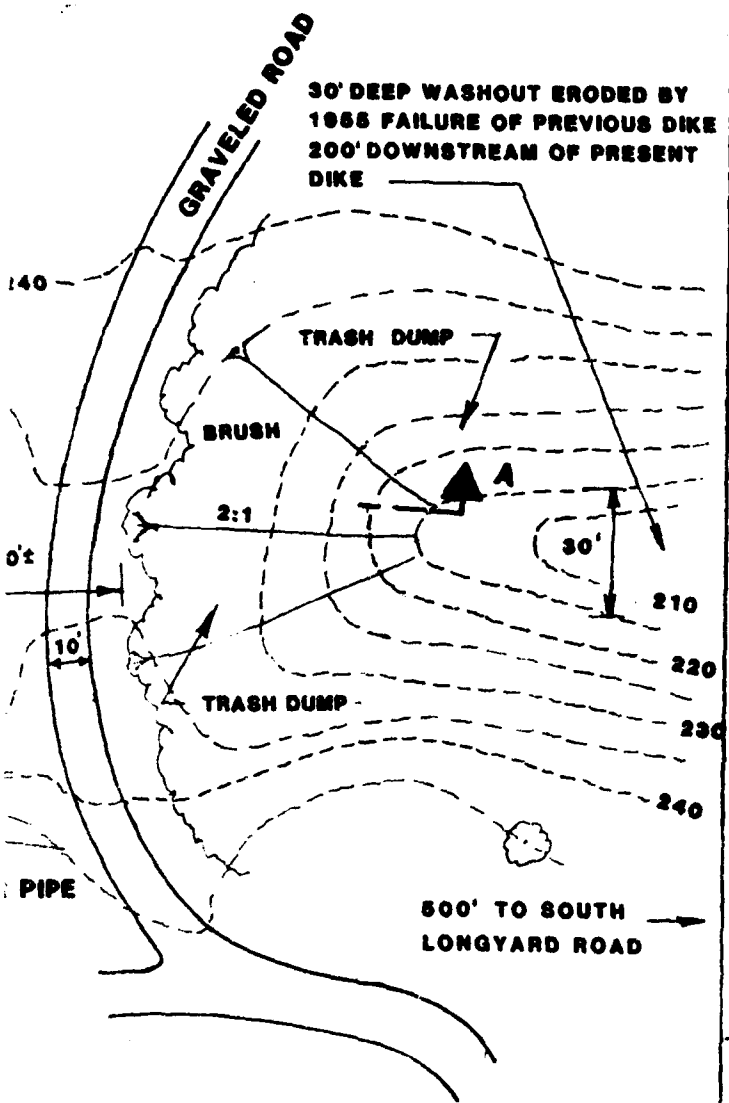
Figure 3. Copy of a portion of construction plans noted in Appendix B-1 is included. Some data from the 1956 plans is also shown on Figures 1 and 2.



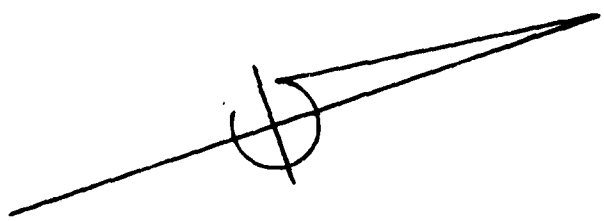
GENERAL PLAN

APPROX. SCALE 1"=40'

CONTOUR INTERVAL 5'



NOTE: Map is traced from plan dated August 1977 entitled MDEQE Division of Waterways "Proposed Outlet Works Congamond Lakes" Datum is Mean Sea Level MSL



APPENDIX B-3 FIGURE 1

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS

ROBERT G. BROWN & ASSOCIATES, INC
Pittsfield, Massachusetts

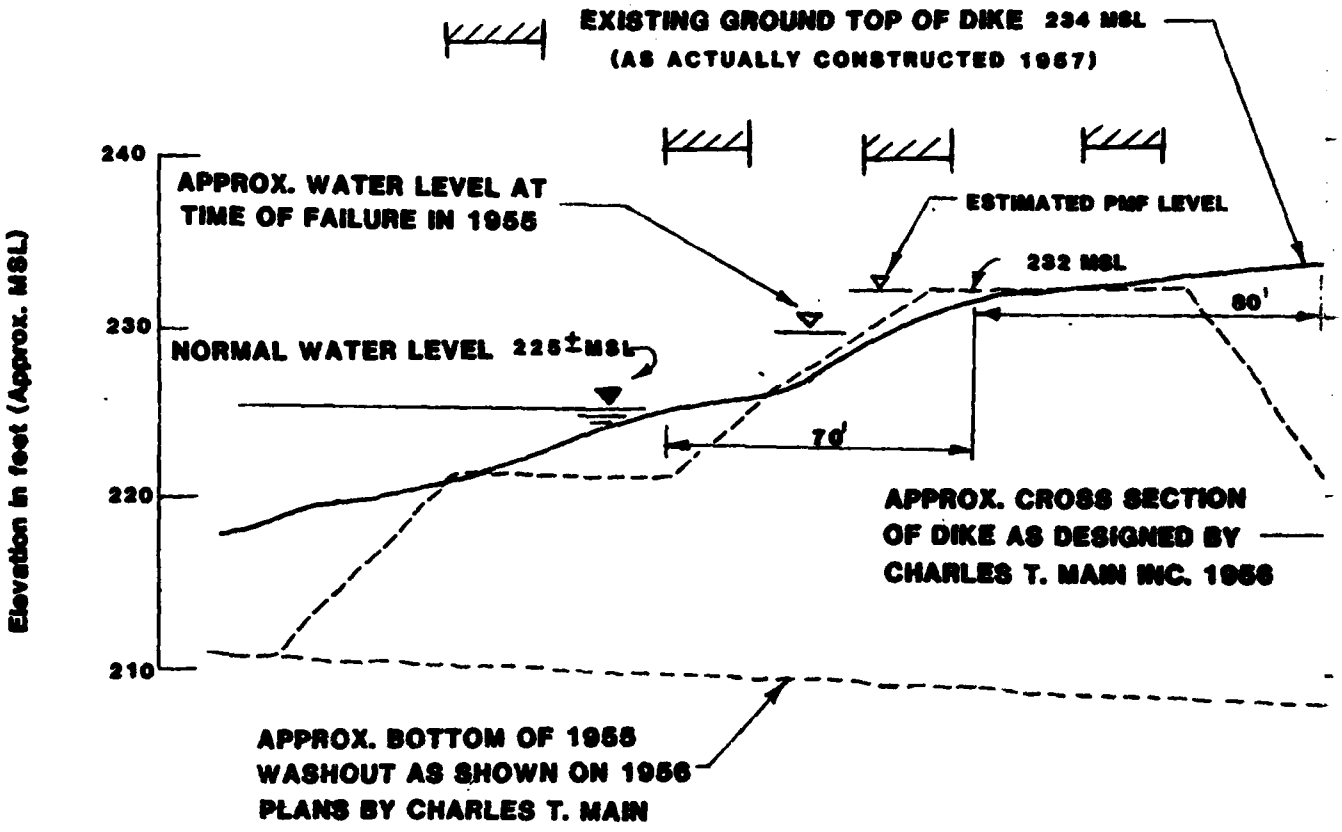
NATIONAL PROGRAM FOR
INSPECTION OF NON-FEDERAL DAMS

CONGAMOND LAKES
NORTH POND DIKE

MA 00072

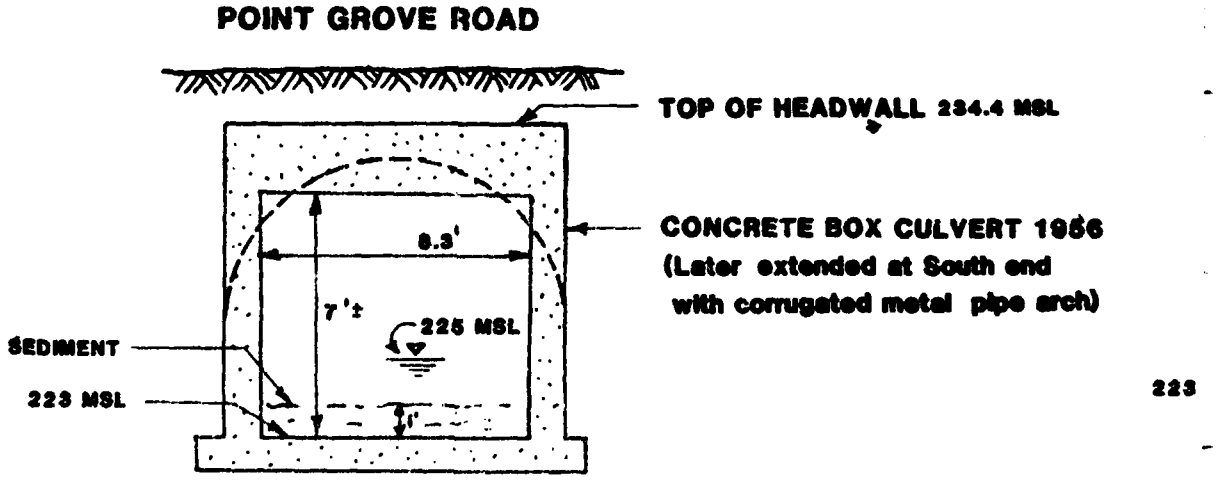
SOUTHWICK MASSACHUSETTS

SCALE: AS NOTED | DATE: AUGUST 1980



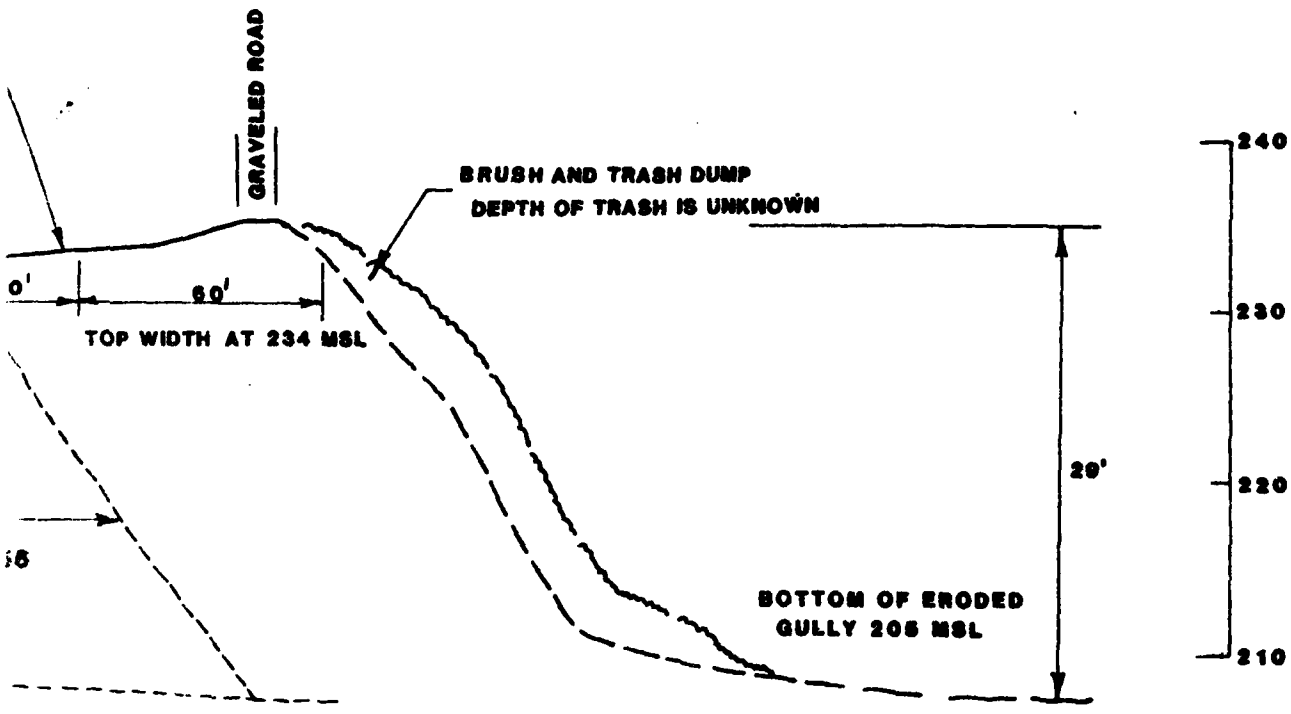
SECTION A-A

APPROX. SCALE 1"= 10'V
1"= 40' H

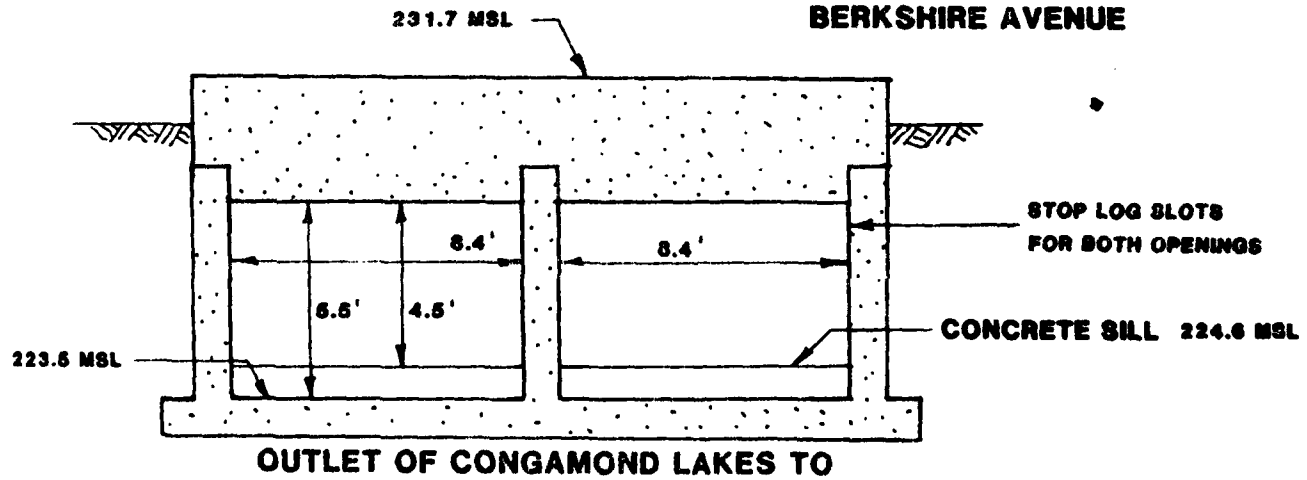


CROSS SECTION OF BOX CULVERT CONNECTING NORTH POND AND MIDDLE POND AT POINT GROVE ROAD

NO SCALE



-A
V
H

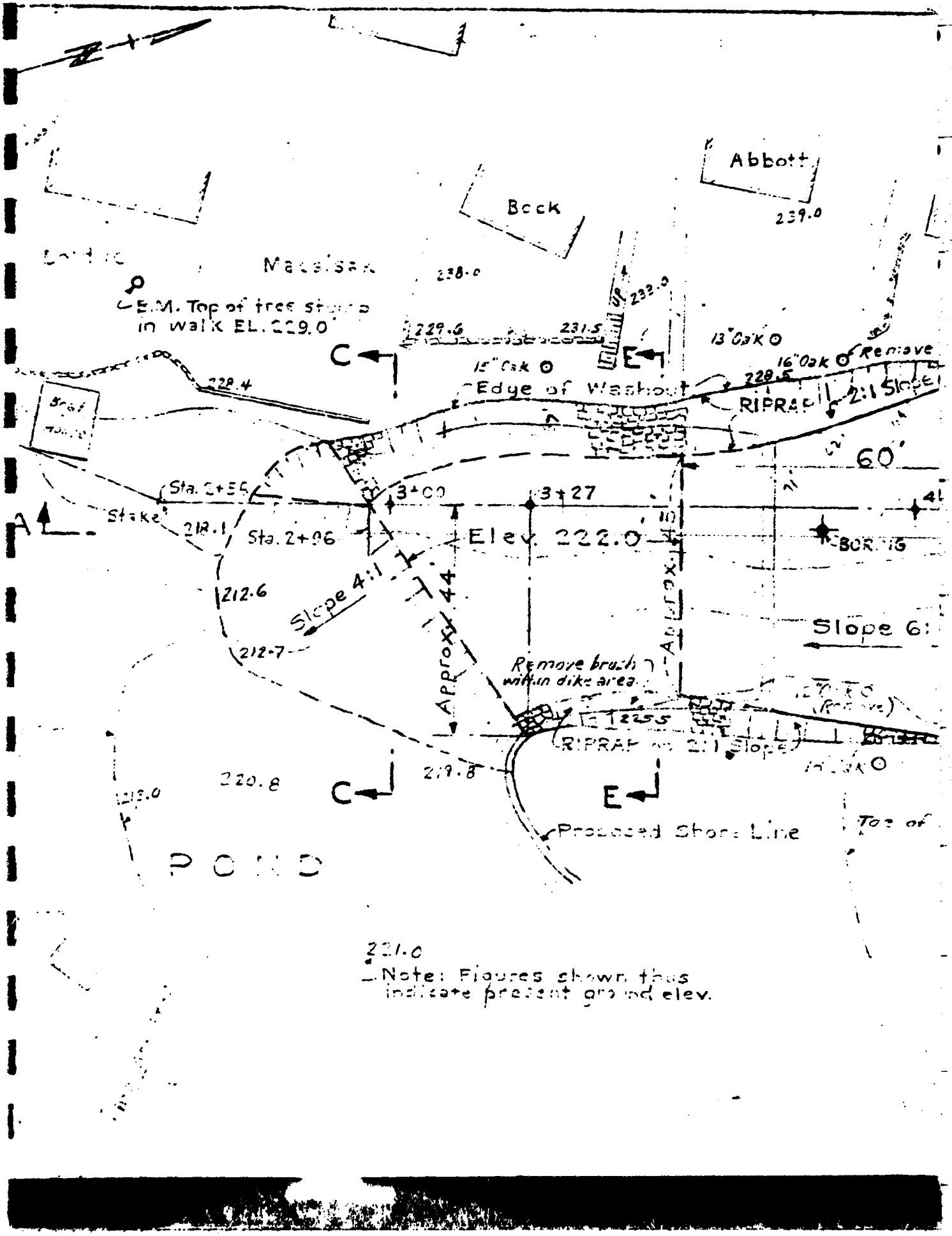


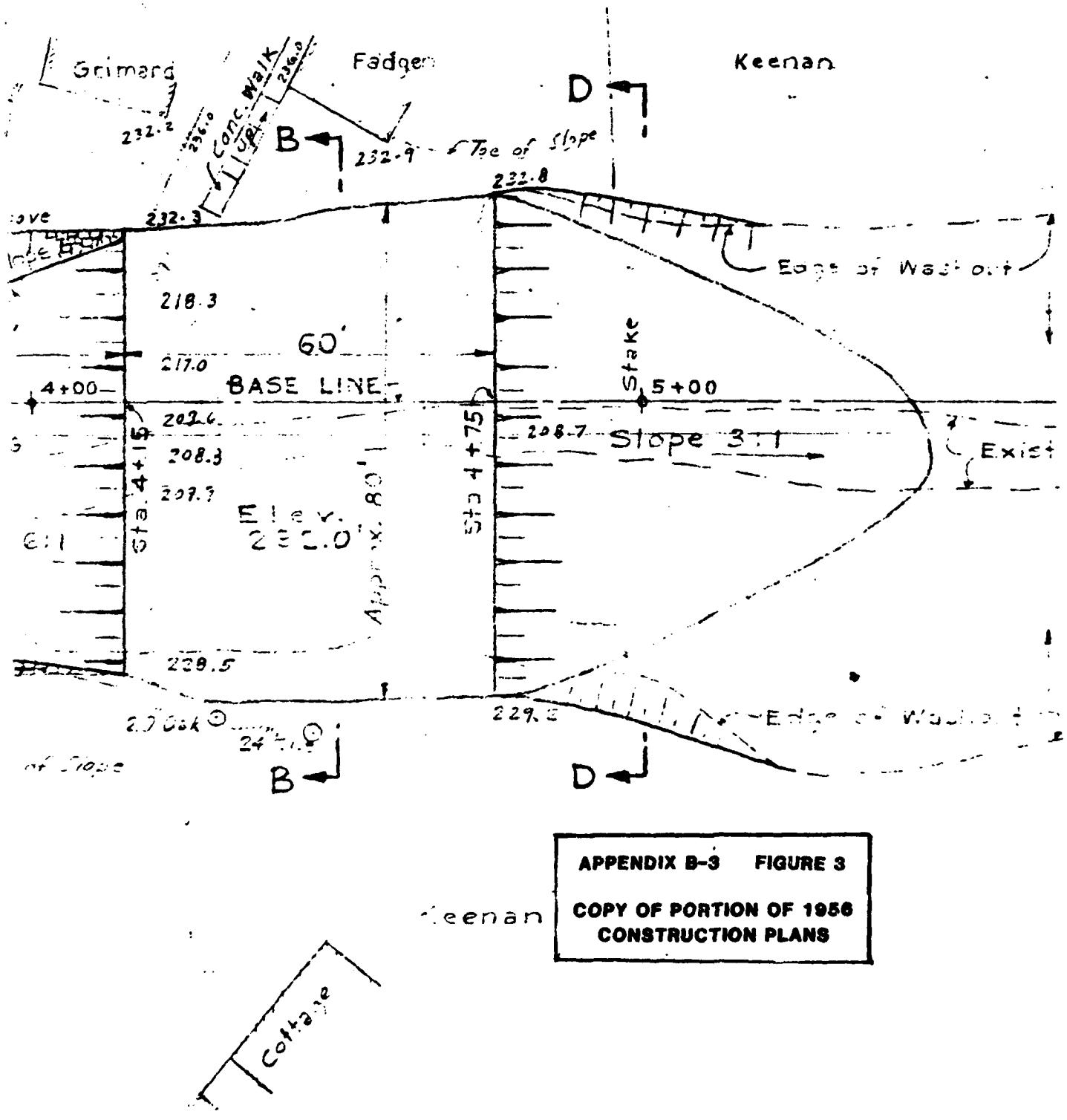
OUTLET OF CONGAMOND LAKES TO
GREAT BROOK AT BERKSHIRE AVENUE

NO SCALE

APPENDIX B-3 FIGURE 2

CONGAMOND LAKES NORTH POND DIKE


Abbott
239.0
Beck
Matelski
238.0
232.0
E.M. Top of tree stump in walk EL. 229.0
229.6
231.5
13" Oak
15" Oak
16" Oak to Remove
Edge of Washout
228.5
RIPRAP
2:1 Slope
228.4
60'
Sta. 2+55
3+00
3+27
Stake
218.1
Sta. 2+96
Elev. 222.0
BOR. 16
212.6
Slope 4:1
Slope 6:
212.7
Approx. 44
Approx. 48
Remove brush within dike area
RIPRAP on 2:1 Slope
220.8
219.8
C
E
Proposed Shore Line
POND
221.0
Note: Figures shown thus indicate present ground elev.



APPENDIX B-3 FIGURE 3

COPY OF PORTION OF 1956 CONSTRUCTION PLANS

TYPICAL BORING LOGS

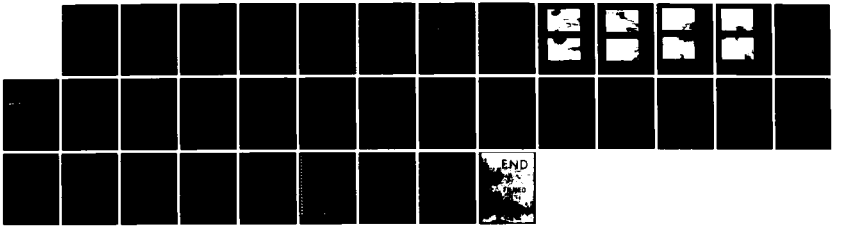
Figure 1. Boring Log included on Sheet 1 of 1956 Construction Plans. Copy attached.

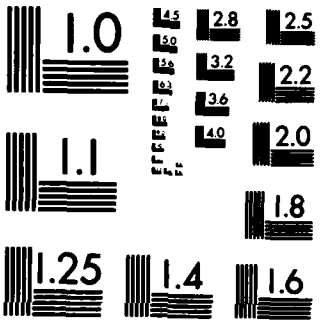
Figure 2. Copy of Representative Test Boring, DH-5, Sheets 1 and 2, July 1977. (Five Test Borings made July 1977 are filed with the Division of Waterways.)

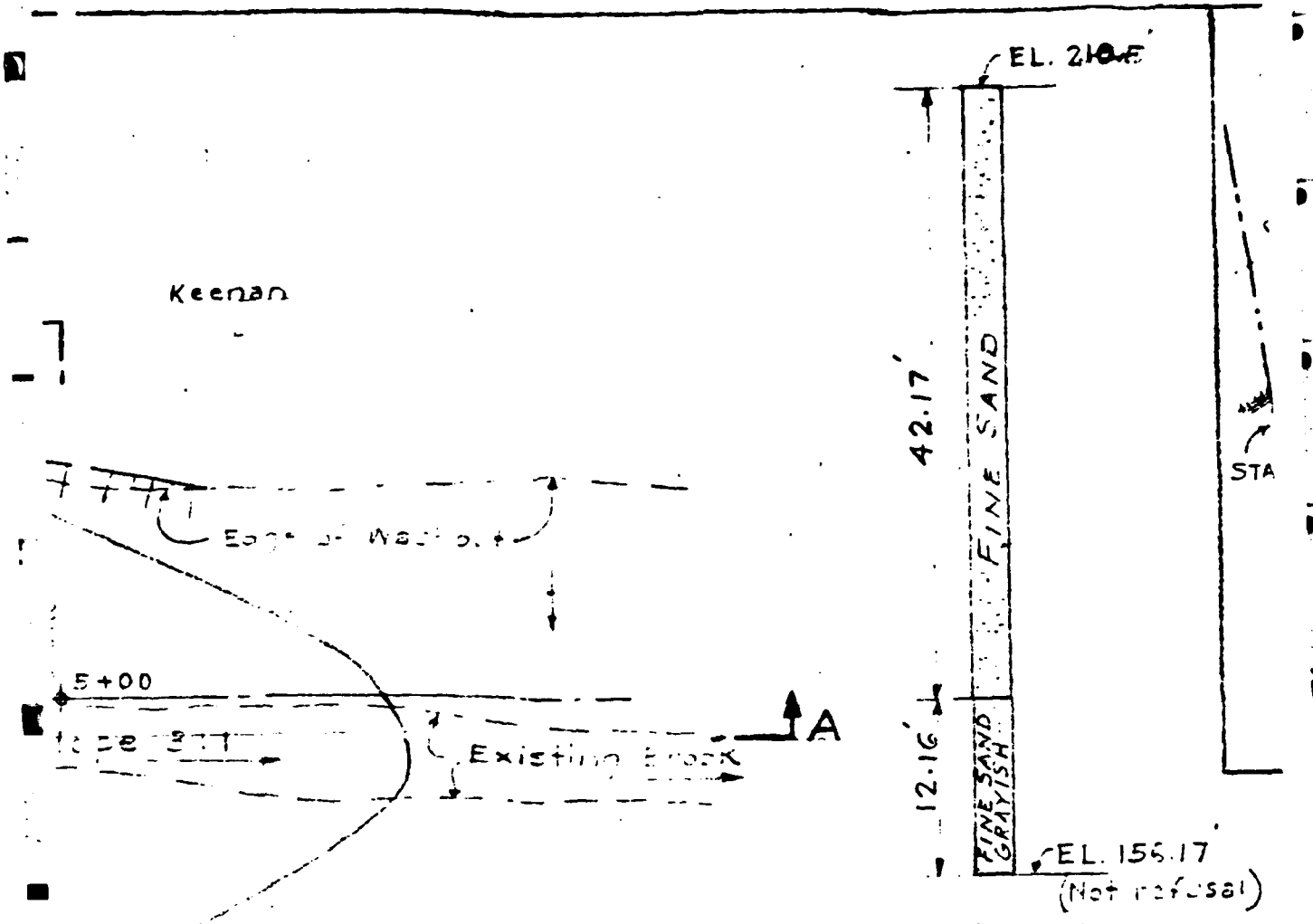
Figure 3. Copy of Permeability Test at DH-5, July 1977.

AD-A145 345 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
CONGAMOND LAKES NORTH.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV AUG 80

UNCLASSIFIED F/G 13/13 NL







BORING LOG
Scale 1"=10'

APPENDIX B-4 FIGURE 1

COPY OF BORING LOG SHOWN ON 1956 CONSTRUCTION PLANS

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 2
DATE
HOLE NO DH-5
LINE & STA
OFFSET
SURF ELEV 235.0

TO Robert G.Brown & Assoc., Inc. | ADDRESS Pittsfield, Mass.
PROJECT NAME Geological Investigation | LOCATION SOUTHWICK, Mass.
REPORT SENT TO above | PROJ NO
SAMPLES SENT TO " | OUR JOB NO 78-15

GROUND WATER OBSERVATIONS
At 32'6" after 1/6 Hours
At ____ after ____ Hours

	Rods-AW	CASING	SAMPLER	CORE BAR
Type		H/S A	S/S	
Size	D	2 1/4"	1-3/8"	
Hammer Wt			140#	BIT
Hammer Fall			30"	

	Date	Time
START	6/24/77	a.m. p.m.
COMPLETE	6/24/77	a.m. p.m.
TOTAL HRS		
BORING FOREMAN	D.Holley	
INSPECTOR	John F.Cysz	
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		5'- 6'-6"	D	1	2	2	moist loose		Brown fine to medium SAND, Little silt, trace fine gravel, cobbles	1	18"	14"
		10'-11'-6"	D	8	14	16	moist medium dense	15'-0"		2	18"	14"
		15'- 16'-6"	D	9	9	11	"	20'-0"	Brown-gray fine to medium SAND, Little fine gravel, Trace silt	3	18"	14"
		20'-21'6"	D	6	10	10	"		Brown-red fine to coarse SAND, some fine to coarse gravel, trace silt	4	18"	12"
		25'- 26'-6"	D	35	47	61	moist very dense	30'-0"		5	18"	14"
		30'-31'6"	D	26	38	49	"		Brown-red fine to medium SAND, same silt, trace fine gravel	6	18"	15"
		35'-36'-6"	D	60	45	50	wet very dense		**APPENDIX B-4 FIGURE 2 TEST BORING DH-5, JULY 1977**	7	18"	18"

GROUND SURFACE TO 60' USED H/S A "CASING THEN S/S to 61'6"

Sample Type
D: Dry C-Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2" O.D Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY
Earth Boring 61'6"
Rock Coring
Samples 12

HOLE NO DH-5

TOWN PRESS - EAST PROV

GUILD D 'ILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 2 OF 2
DATE
HOLE NO DH-5
LINE & STA.
OFFSET
SURF ELEV. 235.0

TO
PROJECT NAME same as 1
REPORT SENT TO
SAMPLES SENT TO
ADDRESS
LOCATION same as 1
PROJ NO
OUR JOB NO

GROUND WATER OBSERVATIONS
At _____ after _____ Hours
At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR
Type			
Size I D	same as 1		
Hammer Wt			BIT
Hammer Fall			

	Date	Time
START		a.m.
COMPLETE		p.m.
TOTAL HRS	same as 1	
BORING FOREMAN		
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	* SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		40'-41'6"	D	20	21	22	wet dense		Brown-red coarse fine SAND, Little fine gravel	8	18"	15"
		45'-46'6"	D	16	16	21	wet hard	46'-0"	Brown-red SILT & very fine sand	9	18"	18"
		50'-51'-6"	D	10	15	20	"			10	18"	15"
		55'- 56'6"	D	8	18	28	"	60'-0"		11	18"	15"
		60'-61'-6"	D	20	30	40	wet ver. dense	61'-6"	Brown very fine SAND & silt	12	18"	18"
									Bottom of Boring 61'-6"			

GROUND SURFACE TO _____ USED _____ "CASING THEN _____

Sample Type
D: Dry C: Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thinwall

Proportions Used

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt x 30" fall on 2" O D Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY
Earth Boring
Rock Coring
Samples

HOLE NO DH-5

TOWN PRESS - EAST PROV

GUILD DRILLING CO., INC.

100 WATER STREET
EAST PROVIDENCE, R I 02914

TELEPHONE
(401) 434-0750

PERM TEST - CONGAMOND LAKE - June 24, 1977 - 6" ϕ hole, 12' depth, W.L. maintained at surface (sides blowing)

FOR: Robert G. Brown & Assoc.,Inc.

Geological Investigation

SOUTHWICK, MASS.

DH # 5

Time	Amt.
12:45PM	0
12:50PM	16 pt's.
12:55PM	16 pt's.
1:00PM	16 pt's.

15 min's. 48 pt's.

DH#5 - Perm Test @ 24' Depth

1:24PM	107 gal's.
1:29PM	116 gal's.
1:34PM	123.8 gal's.
1:39PM	130.0 gal's.

15 min's.

DH#5 Perm Test @39' Depth

2:21PM	151.0 gal's.
2:26PM	167.0 gal's.
2:32PM	183.5 gal's.
2:36PM	192.2 gal's.

15 min's.

DH#5 Perm Test @ 59'Depth

4:08PM	371 Gal's.
4:12PM	423 gal's.
4:15PM	452 gal's.
4:18PM	ran out of water - 490 gal's.

10 min's.

1 hour Perm Testing Time DH#5

Job No. 78-15

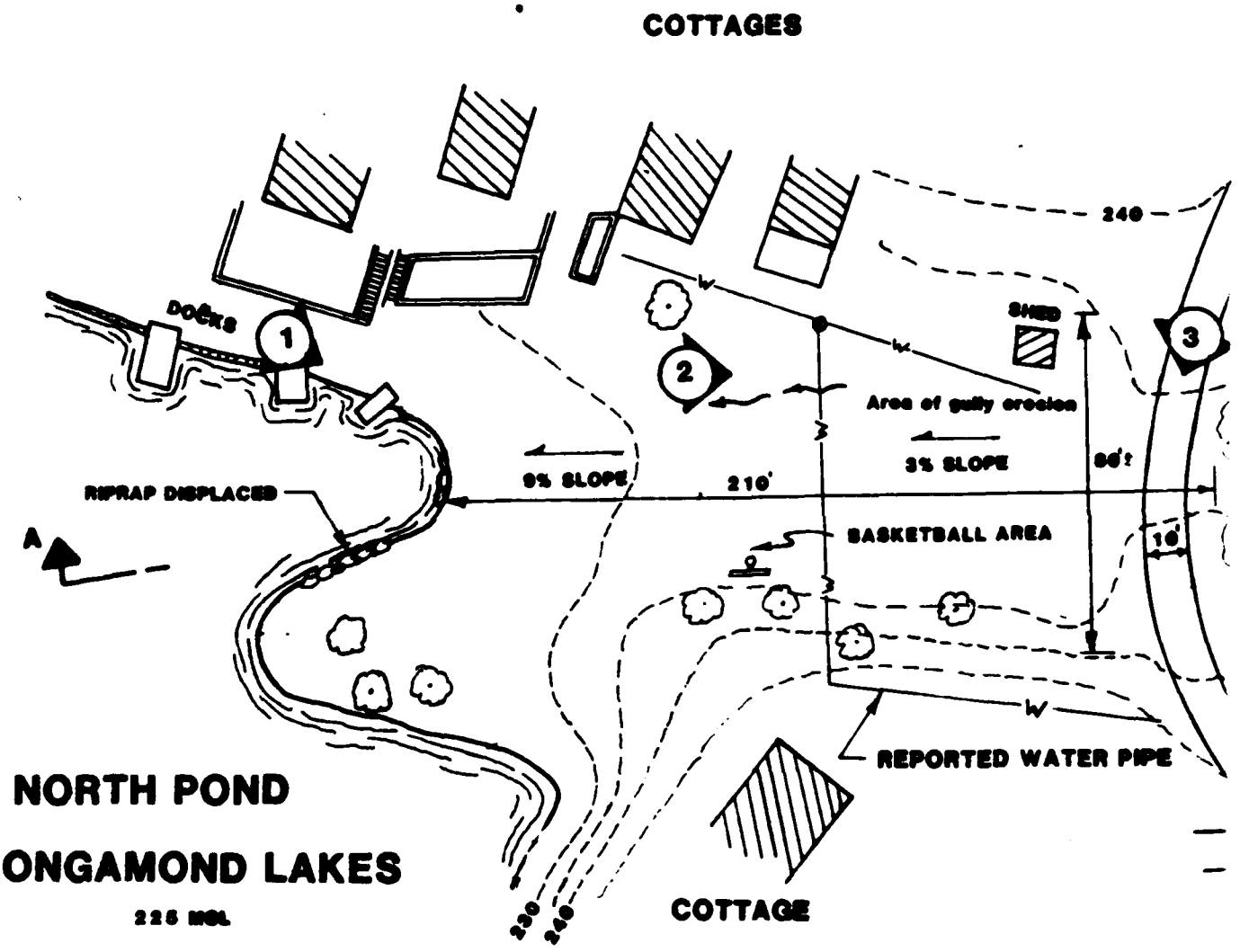
APPENDIX B-4 FIGURE 3
PERMEABILITY TEST DH-5,
JULY 1977

APPENDIX C

PHOTOGRAPHS

C-1. PHOTOGRAPH INDEX

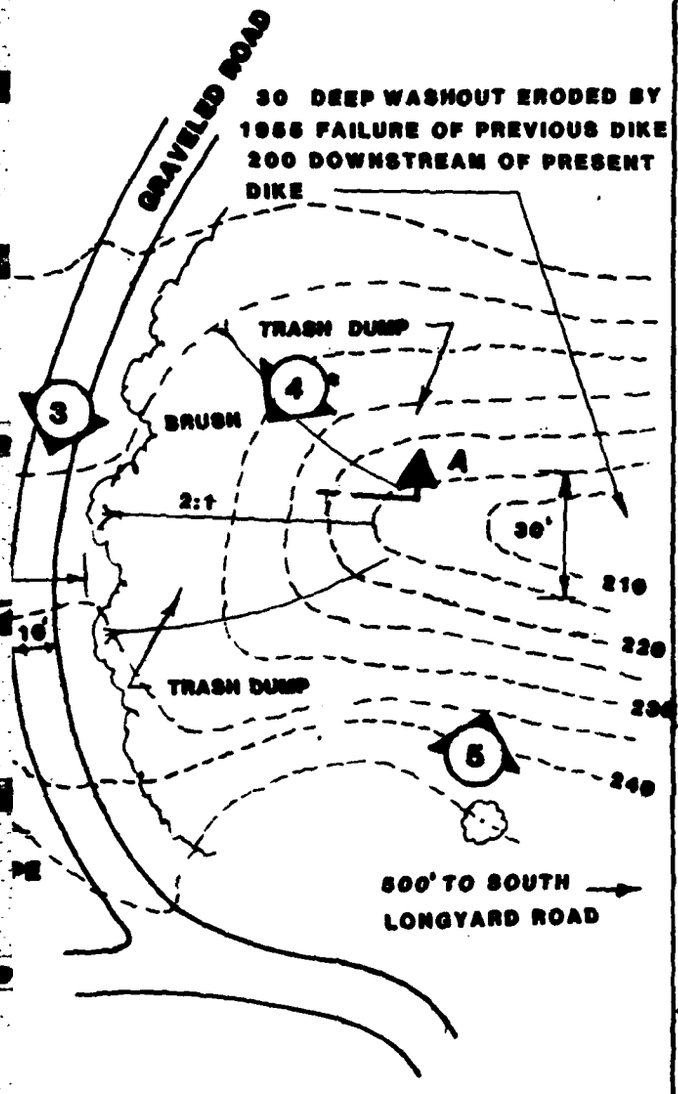
C-2. SELECTED PHOTOGRAPHS



GENERAL PLAN

APPROX. SCALE 1"=40'

CONTOUR INTERVAL 5'



NOTE: Map is traced from plan dated August 1977 entitled MDEQE Division of Waterways "Proposed Outlet Works Congamond Lakes" Datum is Mean Sea Level MSL

1 INDICATES PHOTOGRAPH NUMBER AND DIRECTION IN WHICH PHOTOGRAPH WAS TAKEN

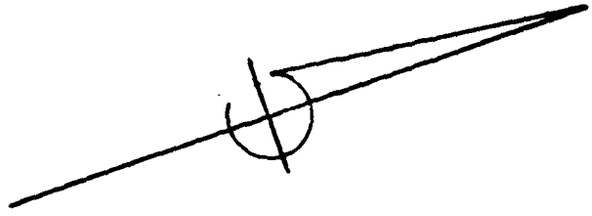


PHOTO #	LOCATION
6	POINT GROVE ROAD BRIDGE
7	BERKSHIRE AVENUE BRIDGE
8	SHAKER ROAD CULVERT

APPENDIX C-1

PHOTOGRAPH INDEX

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS

ROBERT G. BROWN & ASSOCIATES, INC
Pittsfield, Massachusetts

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS

CONGAMOND LAKES NORTH POND DIKE

MA 00072

SOUTHWICK MASSACHUSETTS

SCALE: AS NOTED | DATE: AUGUST 1980

2

Figure 1 - View of upstream face of dike. Note gully erosion on slope and poor vegetation.

Figure 2 - Detailed view of gully erosion and poor vegetation on the upstream face of dike.

Figure 3 - View looking east along top of dike showing 10 foot wide gravel road which crosses over dike. The road provides access to cottages at the west abutment. Note brush piled at top of downstream slope.

Figure 4 - View of downstream face of dike showing trees and trash covering the slope. The presence of the trash prohibits proper inspection of the embankment.

Figure 5 - View of trash dump at downstream toe of dike.

Figure 6 - View of box culvert (north end) between North Pond and Middle Pond at Point Grove Road.

Figure 7 - View of outlet to Great Brook at Berkshire Avenue. Note slots for stop logs which are placed to prevent Great Brook from flowing back into Congamond Lakes during floods.

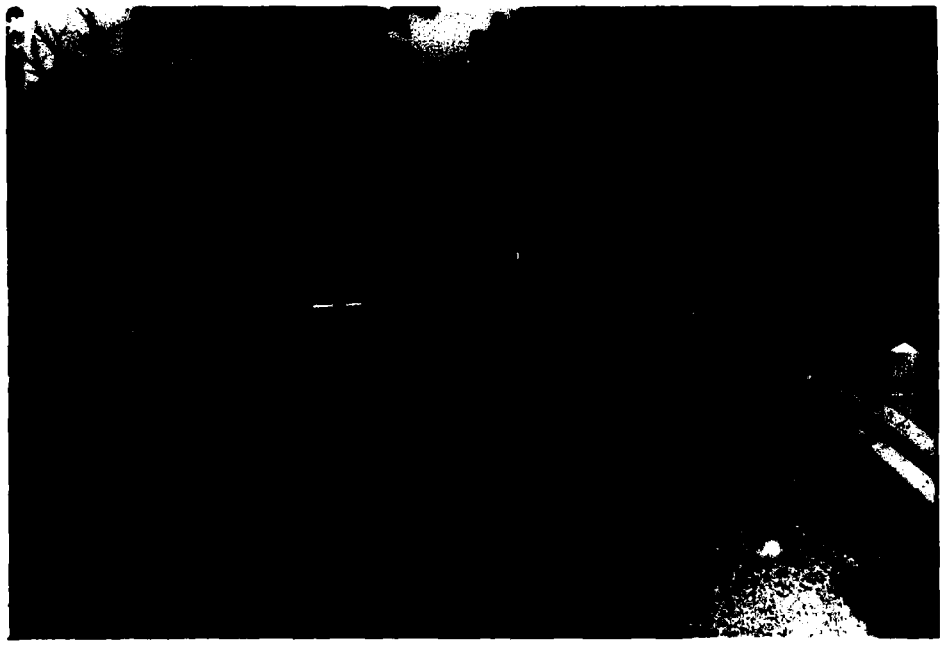


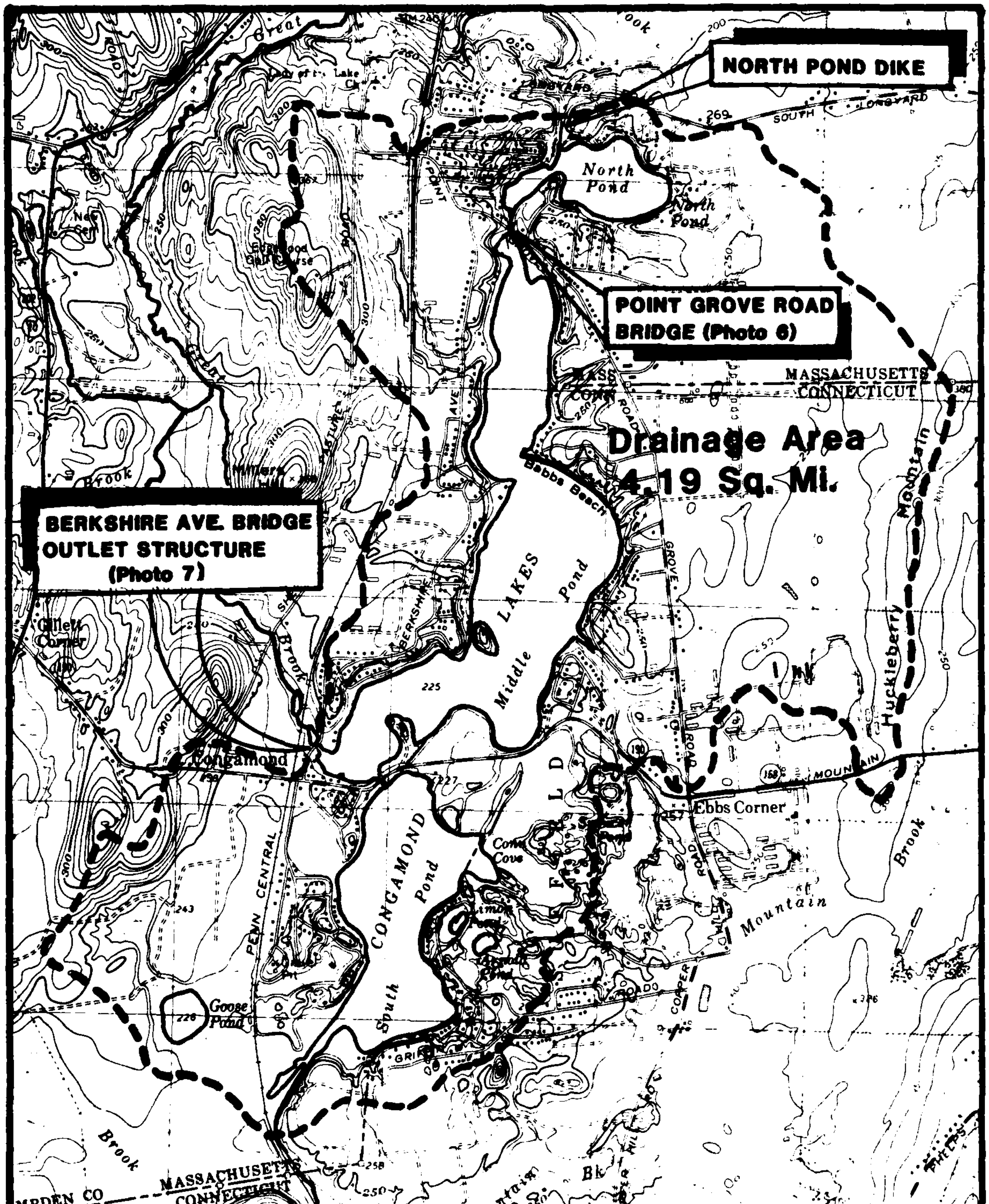
Figure 8 - View of culvert crossing of Great Brook at Shaker Road about 3 miles downstream of dike. Note new homes in the background.

APPENDIX D

HYDRAULIC AND HYDROLOGIC COMPUTATIONS

D-1. DRAINAGE AREA MAP

D-2. COMPUTATIONS



CONGAMOND LAKES

SOUTHWICK, MASS.

Identification No. MA 00072 **D-1**

N

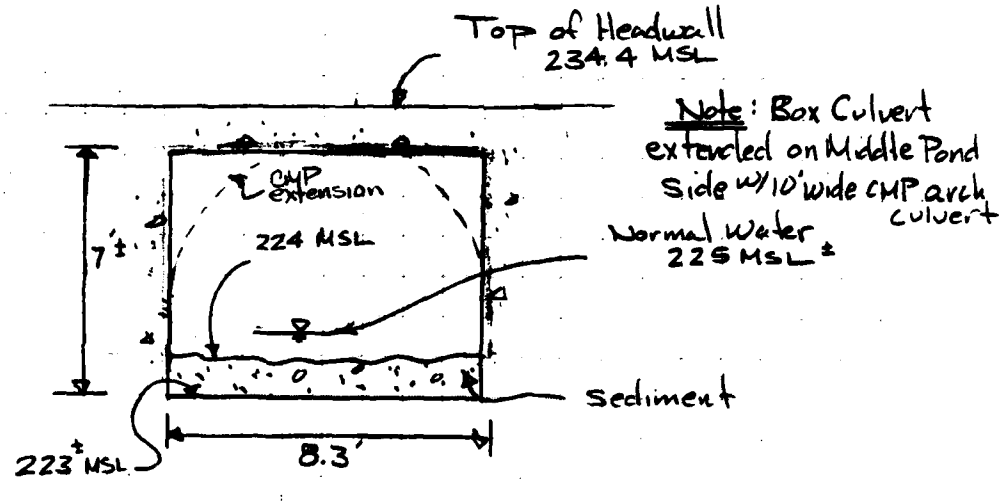
REFER TO LOCATION PLAN FOR HAZARD ANALYSIS AREA

Southwick Quadrangle 1:25000

Robert G. Brown & Associates, Inc.
Berkshire Common - Third Floor North
PITTSFIELD, MASSACHUSETTS 01201
(413) 499-1560

JOB MA72 Congamond Lk - N. Dike
SHEET NO. 1 OF 17
CALCULATED BY JFC DATE 6/21/80
CHECKED BY UMC DATE 7/20/80
SCALE

Present outlet for Congamond Lakes is located on Middle Pond where Berkshire Ave. Crosses Great Brook. North Pond discharges through a Conc. box culvert (8.3' wide, 7' high) under Point Grove Road. This culvert connects North Pond with Middle Pond and acts as an equilizer tube. The normal water level for Congamond Lakes is 225± MSL. The bottom of the culvert under Point Grove Road is comprised of sand and gravel sediment. Normally there is approximately 1 foot of water covering the bottom of this culvert. The total waterway area between the top of the sediment and the top of the culvert is, about 52 square feet.



Cross Section of Culvert
Between North Pond & Middle Pond

APPENDIX D-2

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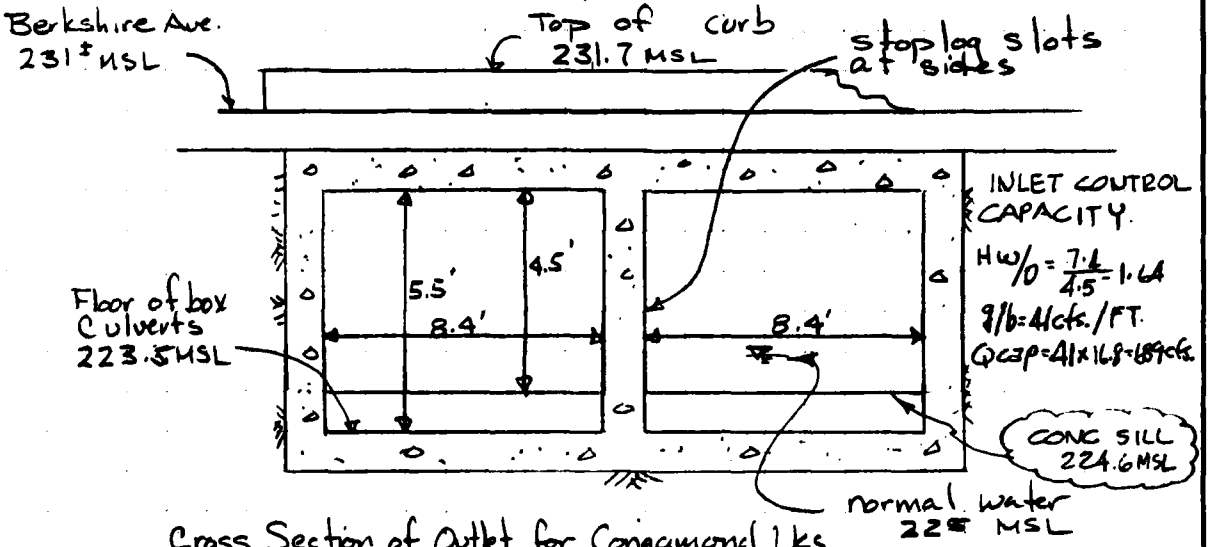
PITTSFIELD, MASSACHUSETTS 01201
(413) 499-1560

JOB MA 72 Congamond Lks. N. Dike
SHEET NO. 2 OF 17
CALCULATED BY JFC DATE 6/21/80
CHECKED BY JMC DATE 7/29/80
SCALE

Note:
There is no other means of discharge from North Pond although Mass. Dept. of Env. Qual. Eng. has proposed an outlet through the North Dike.

Congamond Lakes normally discharge to Great Brk at the Berkshire Ave outlet. During normal flood conditions, however, Great Brook backs up into Congamond Lakes during which time there is no outlet for the lakes. Inorder to prevent lake rise due to backflow from Great Brook, stoplogs are placed at the Berkshire Ave outlet to keep Great Brook from flowing into lakes. After the water level in Great Brook recedes, the stoplogs are removed and water flows from the lakes.

Outlet structure at Berkshire Ave was constructed after the flood of 1955 and is as shown below;



Cross Section of Outlet for Congamond Lks at Berkshire Ave
No Scale

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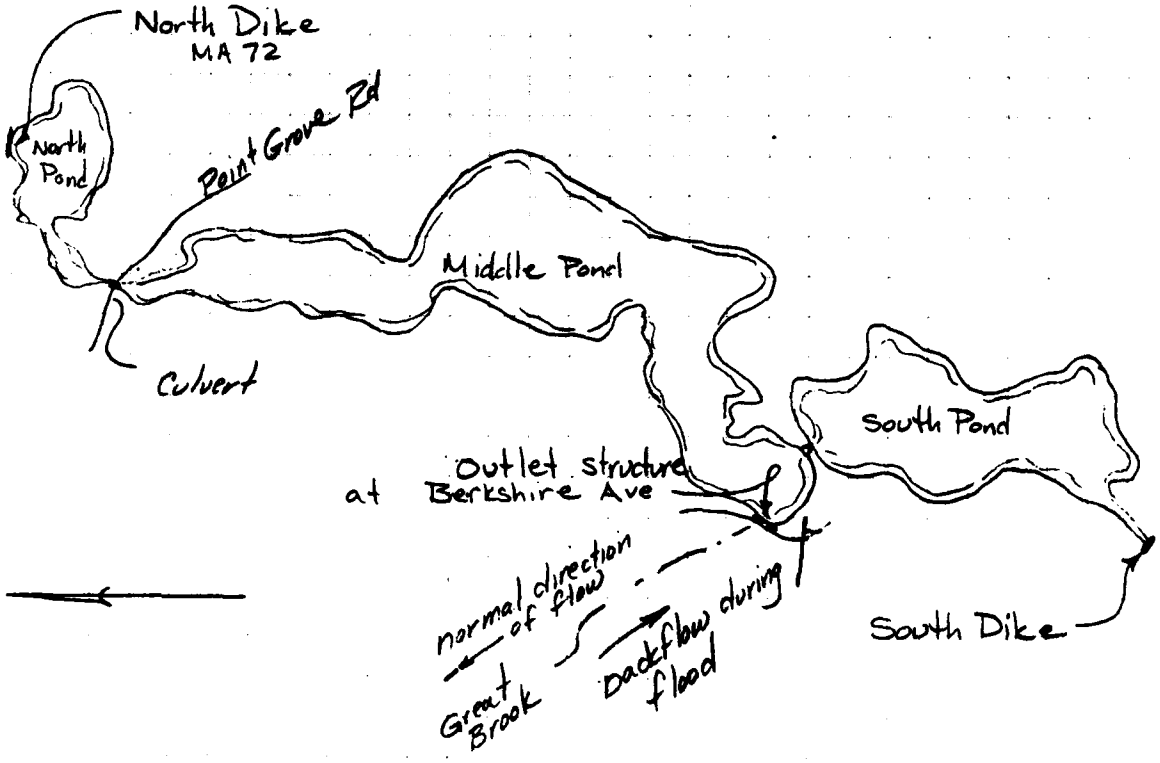
(413) 499-1560

JOB MA 72 Congamond Lk - N. Dike
SHEET NO. 3 OF 17
CALCULATED BY JEC DATE 6/21/80
CHECKED BY JMC DATE 7/20/8
SCALE

Dike at N. Pond blocks former Farmington Canal channel. Canal connected Northampton Mass with New Haven Conn. and included Congamond lakes. A dike a South Pond also now blocks the old canal channel. Prior to canal construction North Pond was not connected to Middle Pond. - (Probably "Kettle Hole")

In 1955 North Pond Dike failed by overtopping. (2 houses destroyed). Dike was rebuilt in 1956 (MDPW plan by C.T. Main Inc.)



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(413) 499-1560

JOB MA 72 Congamond Lks - N. Dike
SHEET NO. 4 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 7/29/80
SCALE

For Hydrologic Analysis Consider Design Condition where normal outlet to Great Brook at Berkshire Ave is sealed by stoplogs and that there is no backflow into lakes from Great Brook.

- Drainage area = 2680 Ac = 4.19 Sq. mi.

Becase there is no outlet under this condition the entire PMF flow is stored.
By National Weather Service Hydrometeorological Report No. 33

PMP (Probable Maximum Precipitation) 6 Hr = 23.2"

Using Corps of Engineers reduction factor for H.R. 33 rainfall values (per Engineering Circular No. 1110-2-27 dated Aug. 1, 1962) this PMP value can be reduced by 20% to provide for imperfect fit of storm isohyetal pattern.

$PMP_{6\,Hr} = 23.2" \times 0.8 = 18.56"$

Per Design of Small Dams U.S. Bur. Rec 1977 ed. p. 49

$PMP_{24\,Hr} = PMP_{6\,Hr} \times 120\% = 18.56 \times 120 = \underline{22.27"}$

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(413) 499-1560

JOB MA72 Congamond Lks - N. Dike
SHEET NO. 5 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 7/29/80
SCALE

Note:
According to May 1956 Study by C.T. Main Inc. Groundwater inflow into lakes is significant during storm conditions ie. Hurricane Dianne 1955.

Estimate total PMP inflow:

1. Direct rainfall on lakes - assume water surface level varies between el. 225 MSL (465 Ac) to el 230 MSL (640 Ac.)

Vol. of Direct rainfall on lakes = $22.27" \times \frac{465+640}{2}\ Ac \times \frac{1}{12} = 1025\ Ac\text{-}ft$ (552 Ac.)

2. Surface Runoff for RCN = 66, by U.S. Soil Cons. Serv. National Engineering Handbook NEH 4 Drwg ES-1001
For P = 22.27", Runoff Q = 17.0"

Vol. of Surface Runoff = $\frac{17.0"}{12} \times (2680 - 552\ Ac) = 3015\ Ac\text{-}ft$

* RCN is assumed based on information contained in "Draft Environmental Impact Report - Flood Control Works Congamond Lakes; Southwick, Mass.; March 1980" prepared by Jason M. Cortell and Associates Inc.

3. Groundwater Inflow - Assume an average inflow of 100 cfs (per C.T. Main 1956 report)

Vol. of groundwater inflow = $\frac{100\ ft^3}{sec} \times \frac{60\ sec}{min} \times \frac{60\ min}{hr} \times \frac{24\ hr}{} \times \frac{Ac\text{-}ft}{43560\ ft^3} = 198\ Ac\text{-}ft$

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JOB MA 72 Congamond Lks - N. Dike
SHEET NO. 6 OF 17
CALCULATED BY JFC DATE 6/23/00
CHECKED BY dmc DATE 7/20/00
SCALE

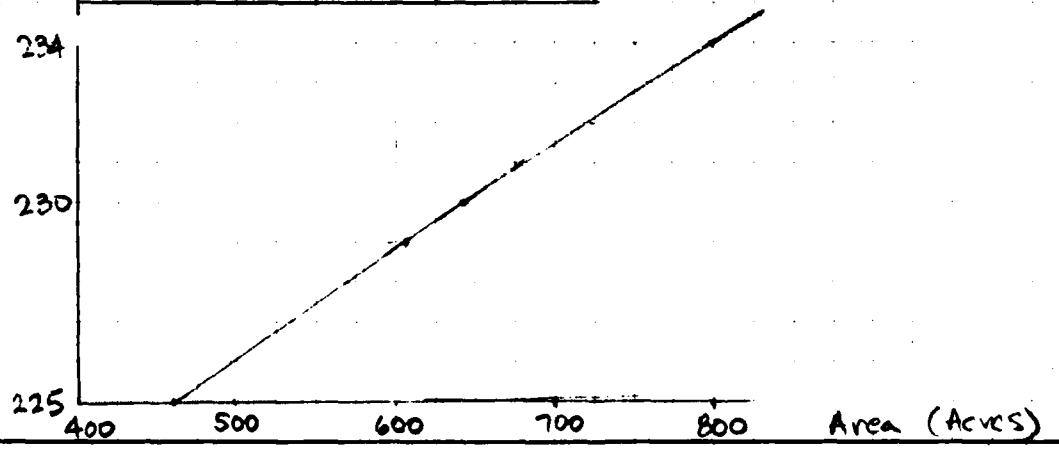
Total Estimated Vol. of Inflow into lakes:

Dir. Rainfall on lakes	1025 Ac-ft ✓
Surf. Runoff	3015 Ac-ft ✓
Groundwater Inflow	198 Ac-ft ✓
	4238 Ac-ft ✓

Calculate Rise of Lakes due to total estimated inflow.

Elev. v. Storage

	Elev.	Area	ΔS	ΣStorage Ac-ft	
Normal Pool →	225 ✓	465 ✓		8500	← Cortell Data
	230 ✓	640 ✓	2760 ✓	11260 ✓	
Top of South Dike →	232	725±	1365 ✓	12625 ✓	- Also approx Top of Bank Ave 3rd Lk
Top of North Dike →	234	800±	1525	14150	- Not possible - would overtop South Dike & Bank Ave @ 232±



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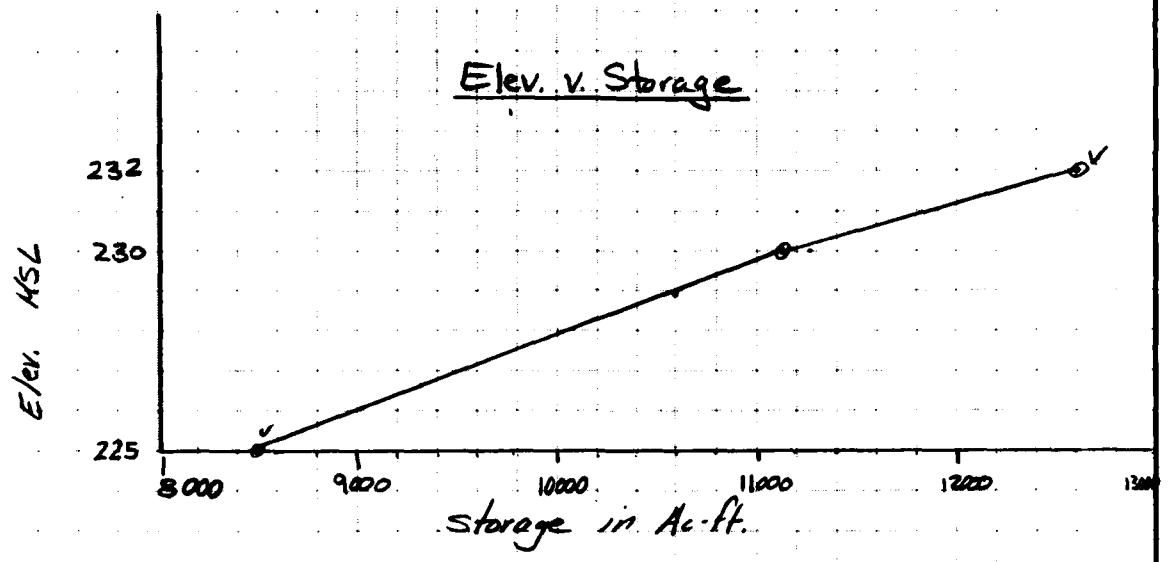
(413) 499-1560

JOB MA 72 Congamond Lks. N. Dike
SHEET NO. 7 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 7/25/80
SCALE



Estimated PMF Level -

8500 Ac ft + 4238 Ac-ft ≈ 12740 Ac-ft ≈ 232 MSL

Note: El. 232 is the original design elevation for the both the north dike and South dikes as called for by MDPW plan ACC03554-A Sept. 1956, prepared by Charles T. Main, Inc. The as-built elevation of the North Dike is el. 234. A 10 ft. wide gravel road across the top of the dike is approximately el. 235.5.

According to C.T. Main rept previously cited, elevation of lakes just prior to failure of north dike was 229.3 MS on Aug. 20, 1955. The total rainfall between Aug. 18, and Aug 19, was about 18". The Main report states that lakes continued to rise after the end of rainfall indicating rapid release of groundwater.

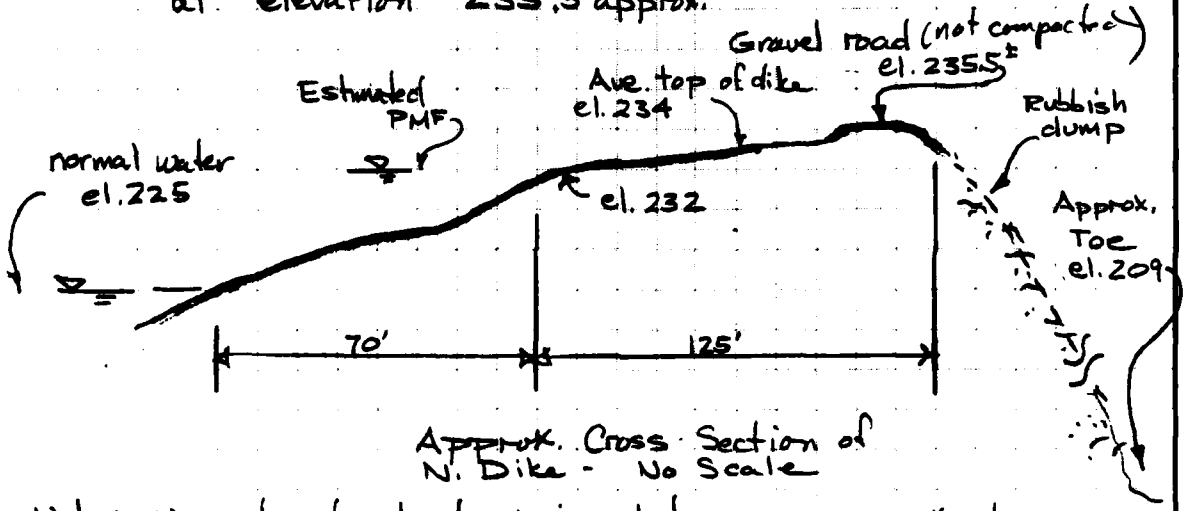
Robert G. Brown & Associates, Inc.
Berkshire Common - Third Floor North
PITTSFIELD, MASSACHUSETTS 01201
(413) 499-1560

JOB MA 72 Congamond Lks - N. Dike
SHEET NO. 8 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 8/24/80
SCALE

C.T. Main report also shows maximum water level in Great Brook at elev. 231.5.

Conclude Regarding overtopping:

As-built elevation 234 MSL at the top of North Dike is above the estimated PMF elevation of 232. The 10 ft. wide gravel road at the top of dike is at elevation 235.5 approx.



Approx. Cross Section of N. Dike - No Scale

Note: Normal water level varies between approx el. 224.6 and 225.5 MSL.
Top of dike is eroded, mostly non-vegetated, grade is not stabilized

Robert G. Brown & Associates, Inc.
Berkshire Common - Third Floor North
PITTSFIELD, MASSACHUSETTS 01201
(413) 499-1560

JOB MA 72 Congamond Lks - N. Dike
SHEET NO 9 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 7/24/80
SCALE

Breach Analysis

Assume breach width W_b of 40% crest length @ mid-ht.

$W_b = 0.4 \times 60' = 24'$ ✓

Assume breach occurs with water level at PMF el. 232 (TEST FLOOD ELEV.)

$$Q_p = 8/27\, W_b \sqrt{g}\, y_o^{3/2}$$ ✓

$$Q_p = (8/27)(24)(32.2)^{1/2}(232-209)^{3/2} = 4,450 \text{ cfs}$$ ✓

Note: Embankment is granular fill - judged to be easily erodible —

Downstream Area -

(1) South Longyard Rd is approximately 300 feet downstream of north dike. There is a 48" R.C.P. culvert under the road at this location. Top of Road ≈ 225

$H_w/D = 22'/4' = 5.5$ ✓

$k_e = 0.5$

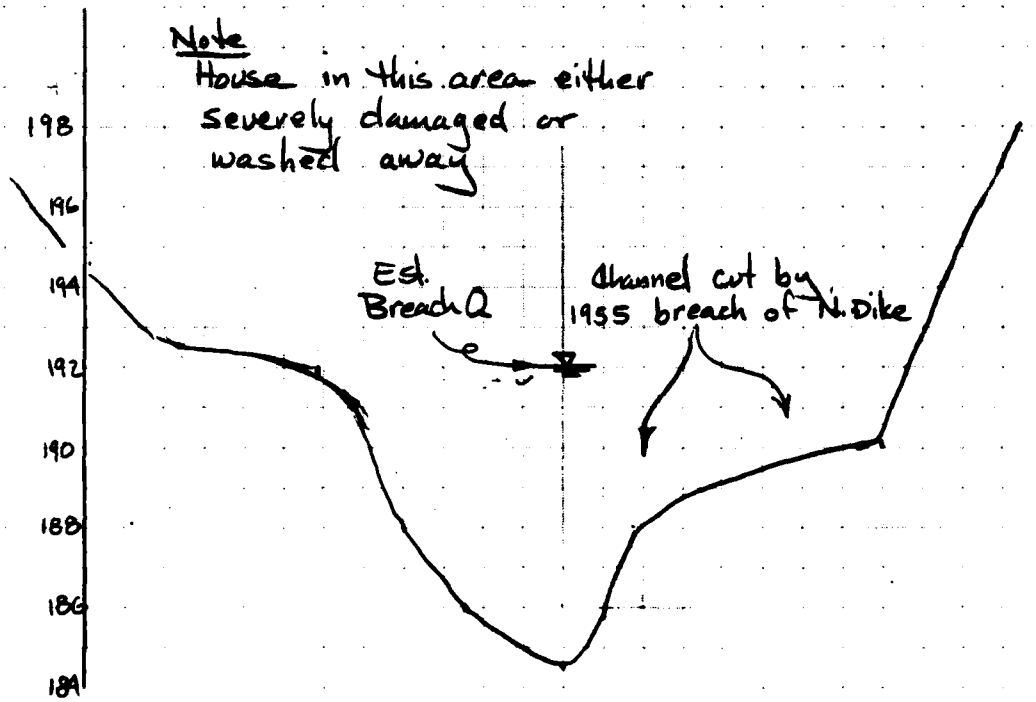
$Q_{cap} = 300$ cfs ✓

Road would probably wash out because of velocity of flood wave.

Robert G. Brown & Associates, Inc.
Berkshire Common - Third Floor North
PITTSFIELD, MASSACHUSETTS 01201
(413) 499-1560

JOB MA 72 Congamond Lks - N. Dike
SHEET NO. 10 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 7/29/80
SCALE

(3) Approximately 1300 feet downstream of north dike there is a newer home to the right of the drainage way. The house is approximately 90' from the center of the drainage way and 8 feet above it.



Cross Section 1300' D/s of North Dike
Section looking u/s
1" = 4' V
1" = 50' H

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Berkshire Common - Third Floor North
PITTSFIELD, MASSACHUSETTS 01201
(413) 499-1560

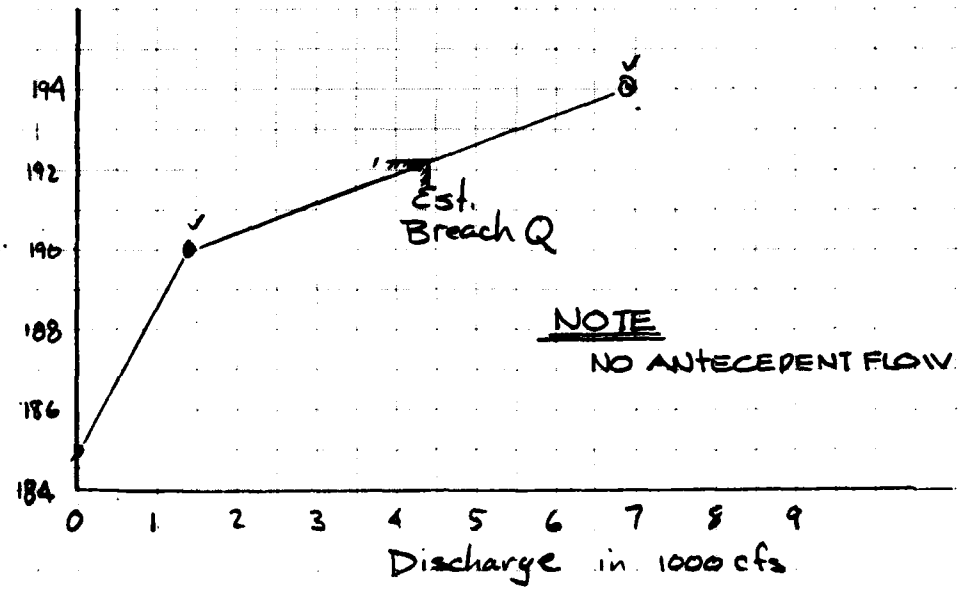
JOB MA 72 Congamond Lks - N. Dike
SHEET NO. 11 OF 17
CALCULATED BY JFC DATE 6/23/80
CHECKED BY JMC DATE 7/30/80
SCALE

S = 0.01 , n = 0.07

$Q = \frac{1.49}{n} A S^{1/2} R_H^{2/3}$ (cfs)

Elev	Area	W_p	R_H	Q
185	0			0
190	390	165	2.36	1475
194	1200	270	4.44	6934

V = 7 fps



NOTE
NO ANTECEDENT FLOW

Drainage way enters Great Brook approx. 2200 feet downstream of dike.

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JOB MA72 Congamond Lks - N. Dike
SHEET NO. 12 OF 17
CALCULATED BY JFC DATE 6/24/80
CHECKED BY JMC DATE 7/20/..
SCALE

Analyze breach effects on Great Brook - Assume antecedent flow in Great Brook equal to ¼PMF as estimated by COE "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations"

Consider Impact Points at Feeding Hills Rd and at Shaker Rd. - Below Shaker Road, Great Brook enters the floodplain of the Westfield River.

Note New development on S. Longyard Rd is high above brook 25-50'

Location	D.A.(1) Sq. Mi.	CSM ¼PMF	¼PMF (cfs)
Feeding Hills Rd	23.1 - 4.2 = 18.9	750/4 = 187	3550
Shaker Road (S'ly crossing)	28.2 - 4.2 = 24.0	700/4 = 175	4200

(1) D.A. does not include drainage area tributary to Congamond Lakes. Under assumed conditions there is no outflow from the lakes into Great Brook through the normal outlet at Berkshire Ave. Outlet is assumed plugged by stoplogs.

USGS Gage just below Shaker Rd (N'ly crossing) DA = 29.2 Sq mi (Gage 1183450)
D.A. @ Shaker Rd (S'ly Crossing) = 29.2 - 1.0 = 28.2 (with Congamond)
D.A. @ Feeding Hills Rd 28.2 - 5.1 = 23.1 " "

Note Drainage Areas seem Conservative

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SHEET NO. 13 OF 17
CALCULATED BY JFC DATE 6/24/80
CHECKED BY JMC DATE 7/2/80
SCALE

Rate Cross Section at Rt-57 (Feeling Hills Rd)

Rate bridge opening as an open channel up to top of opening

Elev.	Area	W_p	R_H	Q
151.	0			0
155	104	34	3.06	437
157	156	40	3.90	771

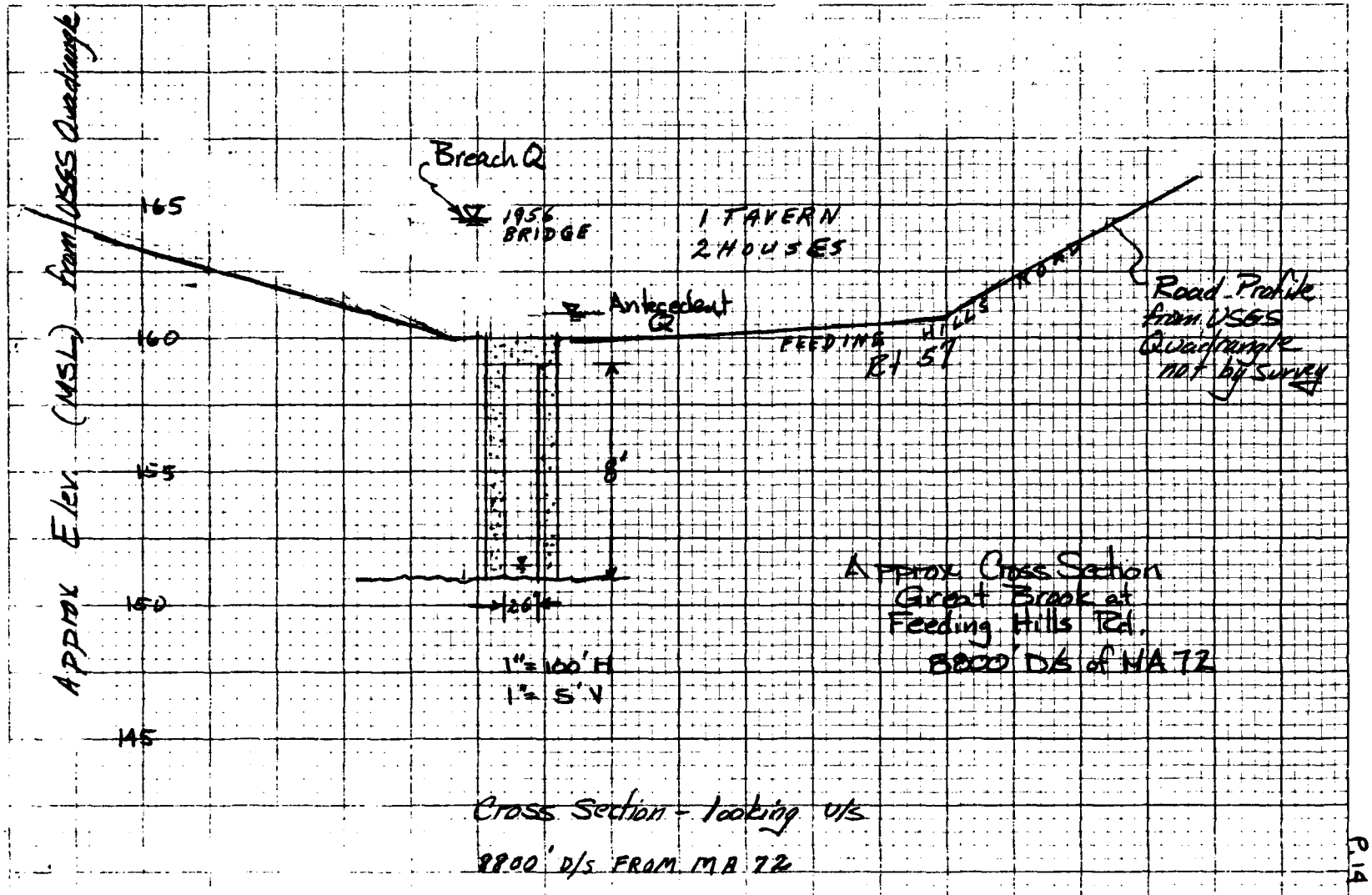
$Q = \frac{1.49}{n} A S^{1/2} R_H^{2/3}$

$n = 0.03$

$S = 0.0016$

For flows over road, Consider weir flow $Q = KLH^{3/2}$ and $Q_{orifice} = CA\sqrt{2g\Delta h}$ for bridge opening (pressure)

	over road flow				Orifice flow				
Elev.	K	L	H	Q	C	A	Δh estimated	Q	Q_{Total}
162	2.6	400	2	2991	0.6	208	3	1735	4676
165	"	"	3	5403	"	"	4	2003	7406


Approx Elev. (MSL) from USGS Quadrangle
165
160
155
150
145
Breach Q
1956 BRIDGE
1 TAVERN
2 HOUSES
Antecedent Q
FEEDING HILLS RD
Road Profile from USGS Quadrangle not by Survey
8'
26'
1" = 100' H
1" = 5' V
Approx Cross Section Great Brook at Feeding Hills Rd. 8800' D/S of MA 72
Cross Section - looking U/S
8800' D/S FROM MA 72

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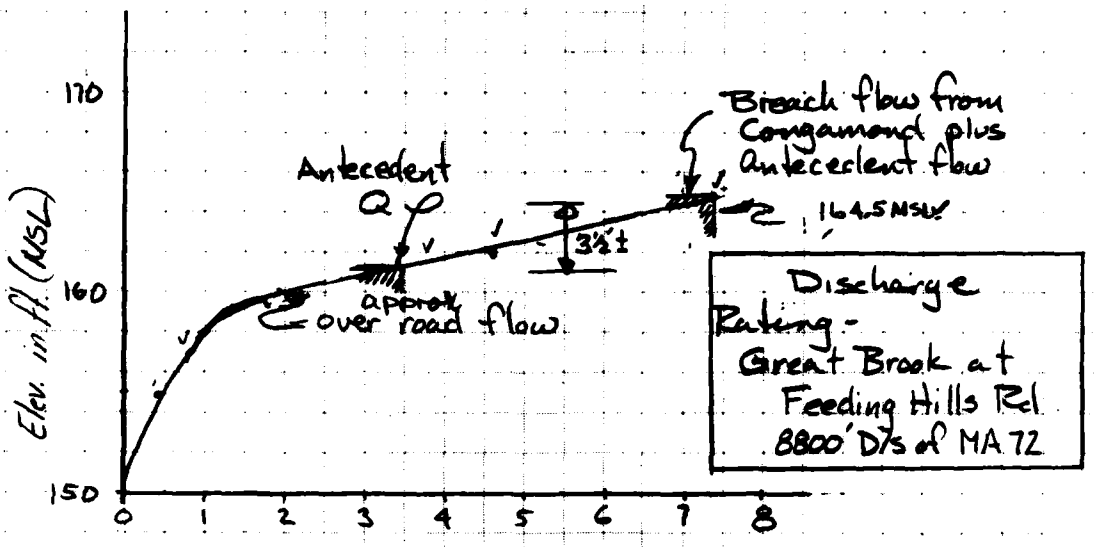
SHEET NO 15 OF 17
CALCULATED BY JFC DATE 6/25/80
CHECKED BY JMC DATE 7/20/80
SCALE



$Q_{p'}$ = Q BREACH = 4,450 cfs.

Q breach + Q antecedent = 4450 + 3550 = 8000 cfs.
=> ELEV. 165 MSL.

$Q_{P_2}^{(trial)} = Q_{p'}\left(1 - \frac{V_1}{S}\right)$ V_1 = 3ft. Surcharge over 150 Ac. of swamp Area = 450 Ac ft.

USE S = 6000 Ac ft. (SEE Pg. 17A)

$Q_{P(trial)} = 4450\left(1 - \frac{450}{6000}\right) = 4116$ cfs

Q_{P_2} (Trial) + $Q_{antecedent}$ = 3550 + 4100 = 7650
=> ELEV = 164.5' MSL

Conclude NO significant change in stage - Volume of water that could flow through breach is large in relationship to floodplain and swamp storage.

NOTE: TAVERN AND 2 HOUSES ESTIMATED 2-4 FEET OF FLOODING. STRUCTURES PROBABLY WOULD NOT BE FLOODED BY ASSUMED ANTECEDENT FLOW. BRIDGE WASHED OUT IN 1955

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JOB MA 72 CONGAMOND LKs - N. DIKE
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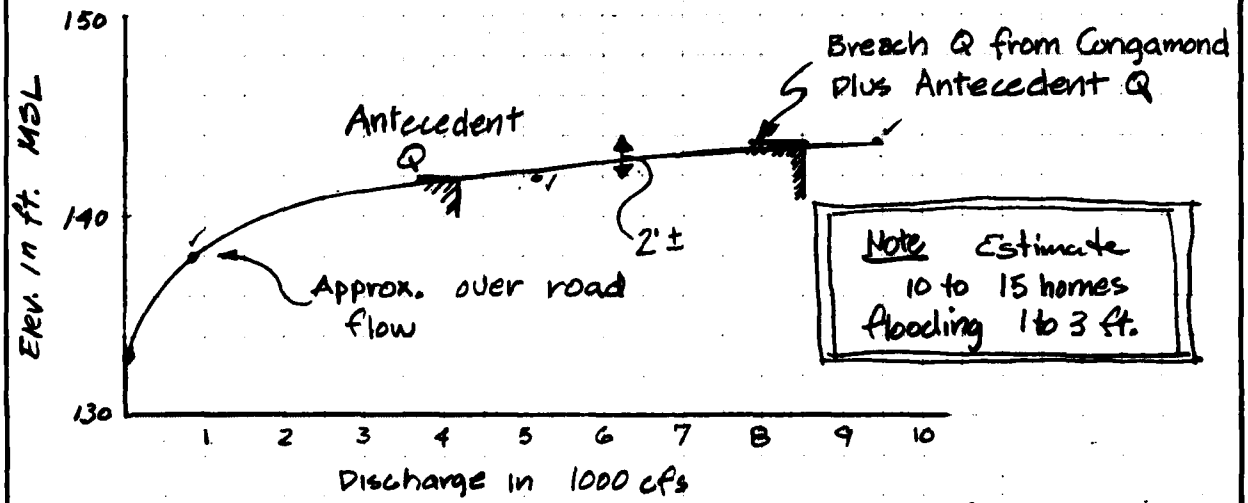
CALCULATED BY JFC DATE 6/25/80
CHECKED BY JMC DATE 7/20/80
SCALE

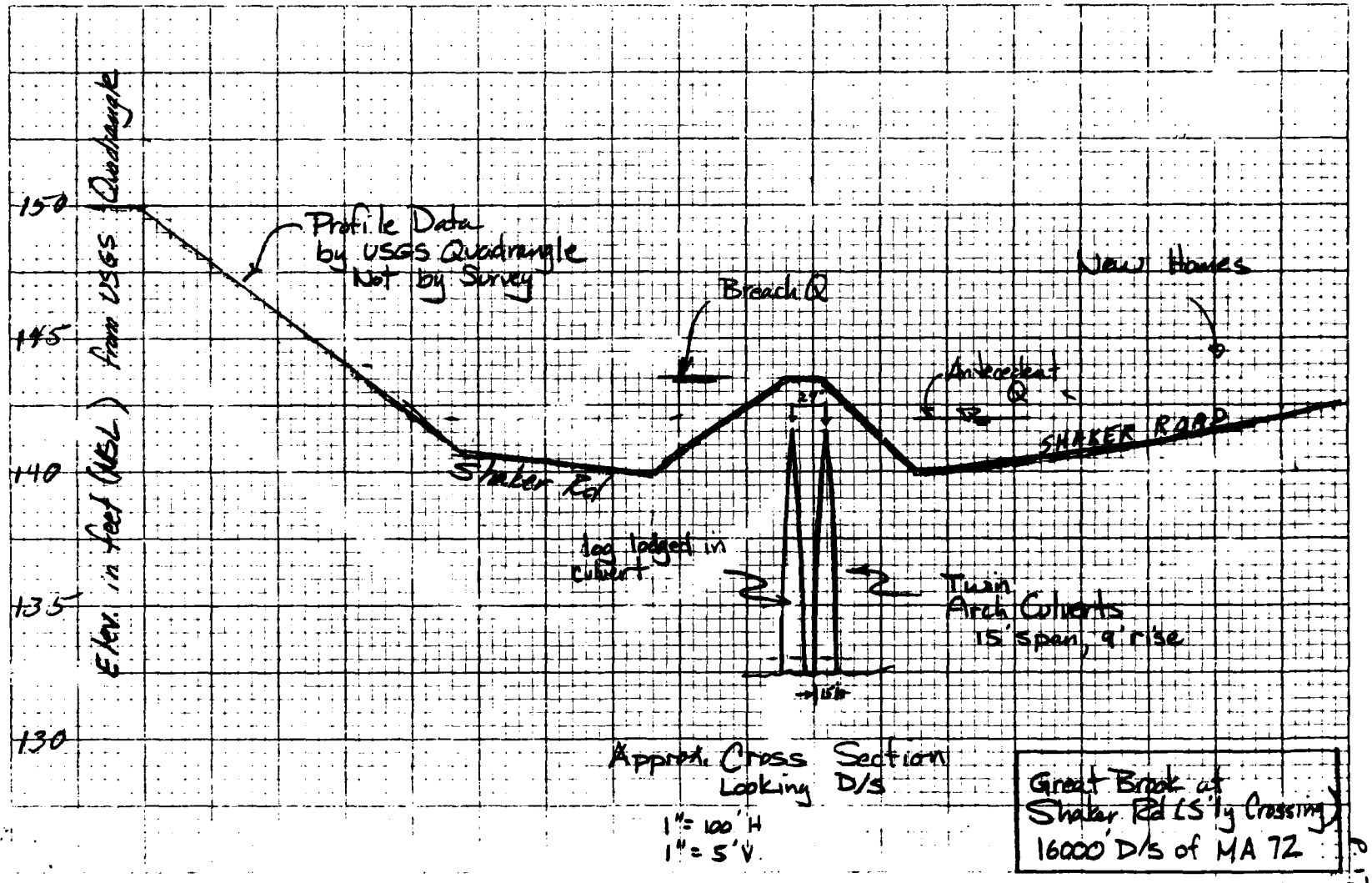
Rate Cross Section at Shaker Rd (S'ly Crossing)
16,000' D/S of MA 72

Elev.	Culvert flow Hw/D	Culvert flow Q each Culv	Culvert flow Q Both Culv	Over road flow C	Over road flow L	Over road flow H	Over road flow Q	Total Q Culvert + Over Road
133			0					0
138	0.6 ✓	450	900 ✓					900
142	1.2 ✓	1100	2200 ✓	2.6	400 ✓	2	2940 ✓	5140 ✓
144	1.33 ✓	1300	2600 ✓	"	500 ✓	3 USE AVE	6755 ✓	9355 ✓

← assumes control at inlet



Note: 1 Mi. Below this loc. - Great Brook enters floodplain of Westfield River


Elev. in feet (NGL) from USGS Quadrangle
150
145
140
135
130
Profile Data by USGS Quadrangle Not by Survey
Breach Q
New Homes
Antecedent Q
SHAKER ROAD
Shaker Rd
log lodged in culvert
Twin Arch Culverts 15' span, 9' rise
Approx. Cross Section Looking D/S
1" = 100' H
1" = 5' V
Great Brook at Shaker Rd (S'ly Crossing) 16000' D/S of MA 72

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JOB MA72 Congamond Lks - N. Dike
SHEET NO. 17A OF 17
CALCULATED BY JEC DATE 7/23/80
CHECKED BY REH DATE 7/25/80
SCALE

Compute Storage which could drain through breach if Culvert holds at Point Grove Rd (Natural High Pt, 223±)

Normal Storage in N. Pond only between normal surface and 30' depth (avg)

$$\text{Vol} = \frac{46\text{Ac} + 25\text{Ac}}{2} \times 30' = 1065 \text{ Ac-ft}$$ North Pond Only

Vol. between 225' MSL and 232' MSL for all lakes

$$\Delta V_1 = \frac{465 \text{ Ac} + 725 \text{ Ac}}{2} \times 7' = 4165 \text{ Ac-ft}$$

$$V + \Delta V_1 = 1065 + 4165 = 5230 \text{ Ac-ft}$$

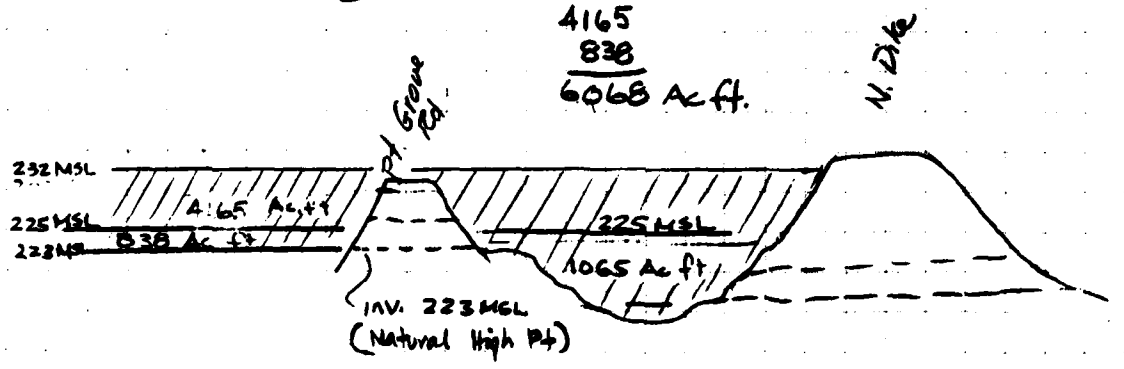
Vol between 223' MSL & 225' MSL for Middle Pond & S. Pond

$$\Delta V_2 = (142 \text{ Ac} + 277 \text{ Ac}) \times 2' = 838 \text{ Ac-ft}$$

Total Volume which could flow through breach if embankment held at Pt. Grove Rd.

$V + V_1 + V_2 =$

1065
4165
838
6068 Ac ft.



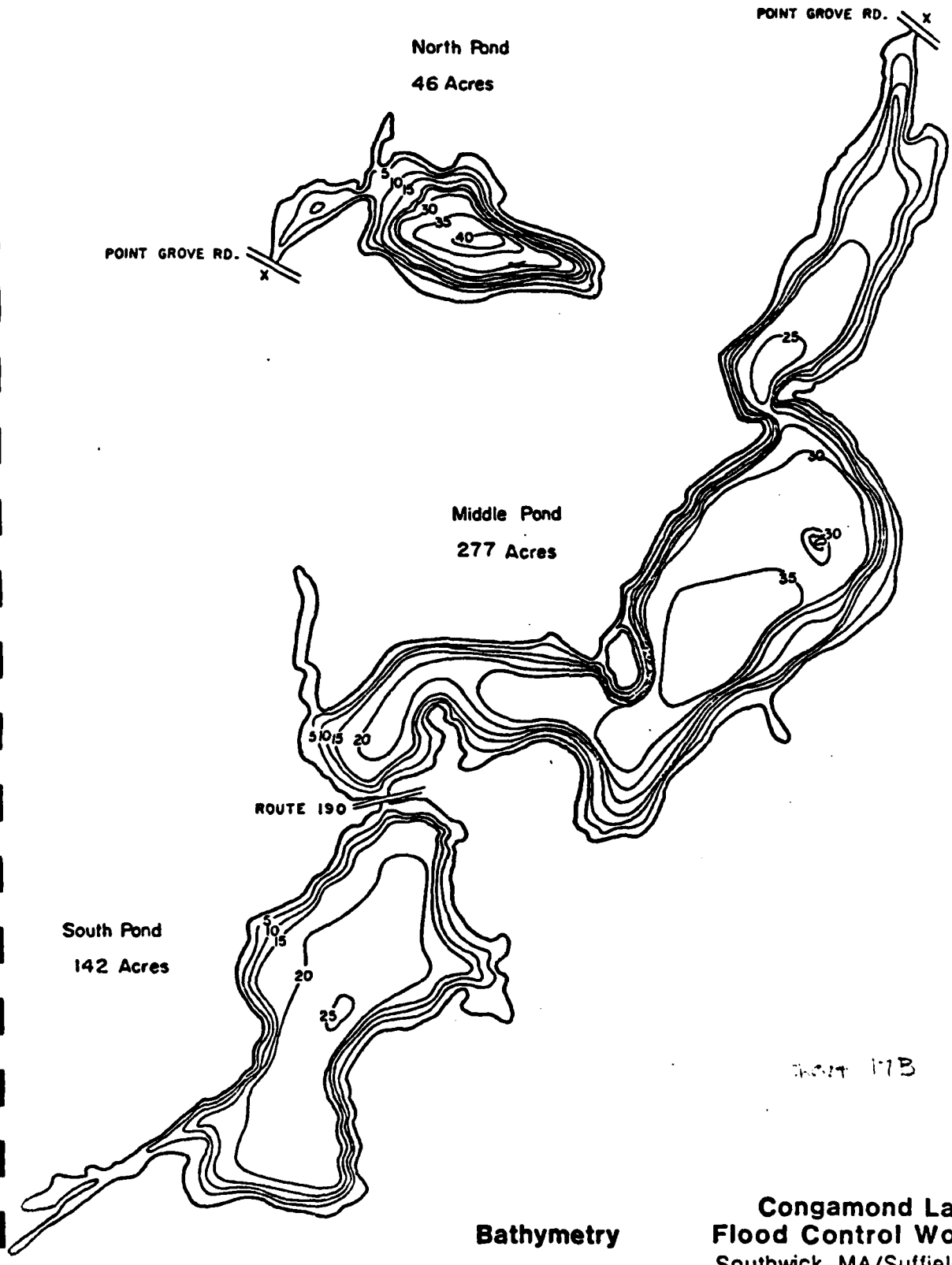


FIGURE 17B

Bathymetry

Congamond Lakes
Flood Control Works
Southwick, MA/Suffield,CT

0 350 1800 3600ft

JASON M. CORTELL and ASSOCIATES INC.

Figure 2-2

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
MA	72	NED	MA	013	01				CONGAMOND LAKES NORTH DIKE	4202.8	7245.4			

POPULAR NAME	NAME OF IMPOUNDMENT
	CONGAMOND LAKES

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	08	GREAT BROOK	SOUTHWICH	0	7050

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
PIPE	1956	D	29	29	12600	8300	NED	N	N	N	N	

REMARKS
23-PLUGS OLD CANAL

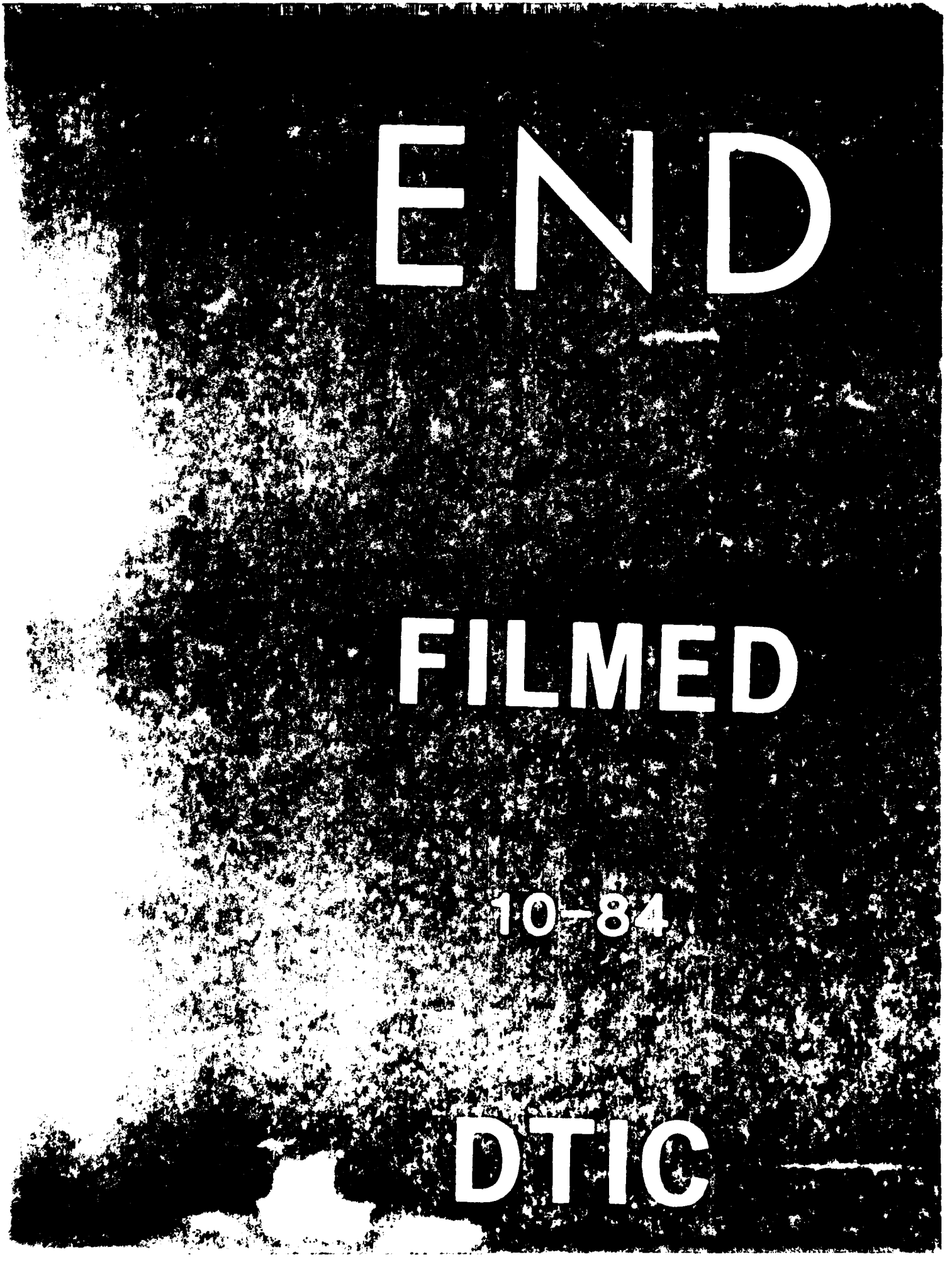
D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	80	N														

OWNER	ENGINEERING BY	CONSTRUCTION BY
NORTHEAST LAND DEVELOP	C T MAIN INC	

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
MASS DIV OF WATER	MASS DIV OF WATER		

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
ROBERT G BROWN INC	06JUN80			PL 92-367

REMARKS


END
FILMED
10-84
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